



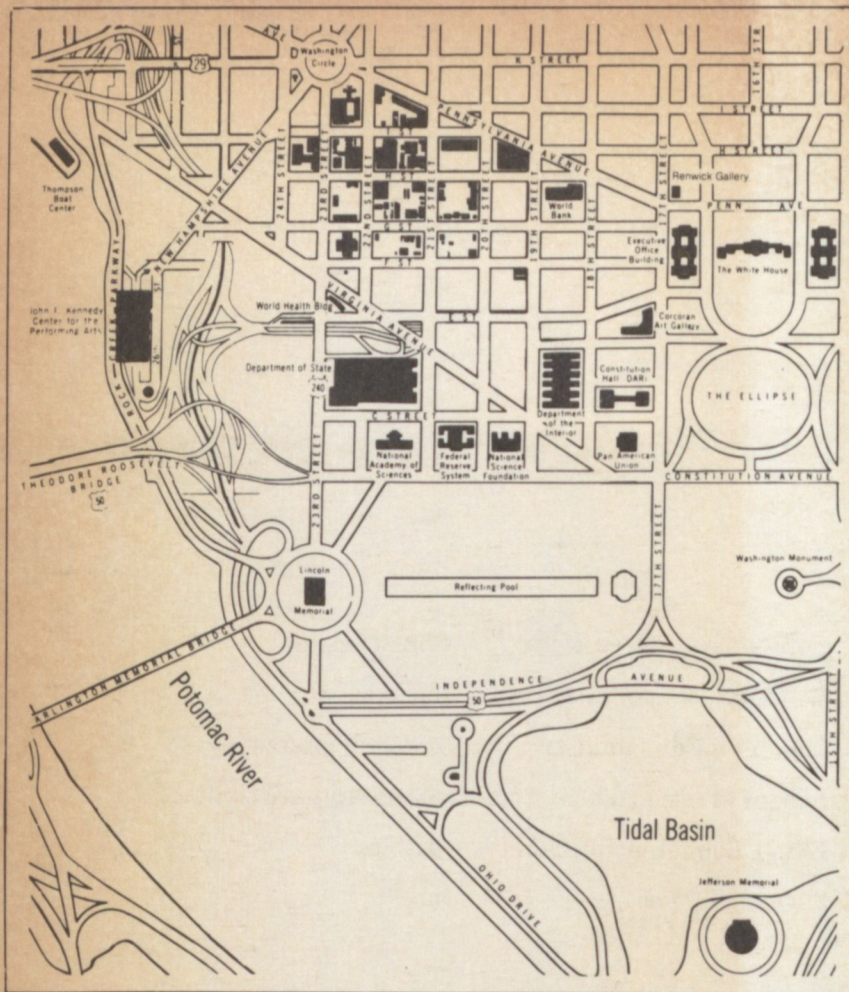
# The George Washington University Bulletin

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Undergraduate  
and Graduate  
Programs

1989–1990





THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN  
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# THE GEORGE WASHINGTON UNIVERSITY BULLETIN

## UNDERGRADUATE AND GRADUATE PROGRAMS 1989-1990

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

Elliott School of International Affairs

Division of Continuing Education

For information concerning the School of Engineering and Applied Science, the National Law Center, or the School of Medicine and Health Sciences, please request the appropriate bulletin.



THE GEORGE WASHINGTON UNIVERSITY LIBRARY

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Columbia College of Arts and Sciences

Columbia School of Arts and Sciences

School of Education and Human Development

School of Government and Public Administration

Ellison School of International Affairs

Division of Continuing Education



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## THE CALENDAR 1989-1990\*

AUGUST 1989							DECEMBER 1989							APRIL 1990							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
			1	2	3	4						1	2		1	2	3	4	5	6	7
6	7	8	9	10	11	12		3	4	5	6	7	8	9	8	9	10	11	12	13	14
13	14	15	16	17	18	19		10	11	12	13	14	15	16	15	16	17	18	19	20	21
20	21	22	23	24	25	26		17	18	19	20	21	22	23	22	23	24	25	26	27	28
27	28	29	30	31				24	25	26	27	28	29	30	29	30					
								31													
SEPTEMBER 1989							JANUARY 1990							MAY 1990							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
					1	2						1	2						1	2	3
3	4	5	6	7	8	9		7	8	9	10	11	12	13	6	7	8	9	10	11	12
10	11	12	13	14	15	16		14	15	16	17	18	19	20	13	14	15	16	17	18	19
17	18	19	20	21	22	23		21	22	23	24	25	26	27	20	21	22	23	24	25	26
24	25	26	27	28	29	30		28	29	30	31				27	28	29	30	31		
OCTOBER 1989							FEBRUARY 1990							JUNE 1990							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
						1						1	2	3						1	2
8	9	10	11	12	13	14		4	5	6	7	8	9	10	3	4	5	6	7	8	9
15	16	17	18	19	20	21		11	12	13	14	15	16	17	10	11	12	13	14	15	16
22	23	24	25	26	27	28		18	19	20	21	22	23	24	17	18	19	20	21	22	23
29	30	31						25	26	27	28				24	25	26	27	28	29	30
NOVEMBER 1989							MARCH 1990							JULY 1990							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
					1	2						1	2	3						1	2
5	6	7	8	9	10	11		4	5	6	7	8	9	10	8	9	10	11	12	13	14
12	13	14	15	16	17	18		11	12	13	14	15	16	17	15	16	17	18	19	20	21
19	20	21	22	23	24	25		18	19	20	21	22	23	24	22	23	24	25	26	27	28
26	27	28	29	30				25	26	27	28	29	30	31	29	30	31				

### 1989 FALL SEMESTER

August 22-23	Orientation for students from foreign countries
August 24-25	Orientation and placement tests for new students
†August 28-30	Registration
August 31	Classes begin
September 4	Labor Day (holiday)
September 6	University Faculty Assembly meeting
September 8	Fall Convocation
September 15	Faculty Senate meeting
October 1	Applications due for February graduation
	Applications due for November Master's Comprehensive Examinations in the Elliott School of International Affairs and the School of Government and Business Administration
October 13	Faculty Senate meeting
October 19	Board of Trustees meeting
November 1	Applications due for spring semester financial aid
November 3	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
November 3-4	Elliott School of International Affairs and School of Government and Business Administration Master's Comprehensive Examinations
November 10	Faculty Senate meeting

\* The Academic Calendar is subject to change.

† The registration procedure and the hours of registration are stated in the *Schedule of Classes*, which is available in advance of each semester.



- November 23-24 Thanksgiving holiday
- November 27 Doctoral dissertations due from February candidates in the Graduate School of Arts and Sciences, the School of Education and Human Development, and the School of Government and Business Administration
- December 2 Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
- December 7 Last day of fall semester classes
- December 8 Faculty Senate meeting
- December 11-19 Examination period

### 1990 SPRING SEMESTER

- January 3 All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for February graduation
- January 4-5 Orientation for new students and students from foreign countries
- Master's theses due from February candidates
- \*January 8-10 Registration
- January 11 Spring semester classes begin
- January 15 Martin Luther King Day (holiday)
- January 18 Board of Trustees meeting
- January 19 Faculty Senate meeting
- January 23 University Faculty Assembly meeting
- February 1 Applications due for May graduation
- February 9 Faculty Senate meeting
- February 18 Winter Convocation
- February 19 George Washington's birthday observed (holiday)
- February 28 Applications due for April Master's Comprehensive Examinations in the Elliott School of International Affairs and the School of Government and Business Administration
- March 1 Deadline for submission of 1990-91 undergraduate financial aid applications
- March 2 Doctoral dissertations due from May candidates in the Graduate School of Arts and Sciences and the School of Education and Human Development
- March 9 Faculty Senate meeting
- March 12-16 Spring recess
- March 15 Board of Trustees meeting
- March 16 Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
- March 19 Doctoral dissertations due from May candidates in the School of Government and Business Administration
- April 1 Deadline for submission of summer sessions and 1990-91 graduate financial aid applications
- April 13 Faculty Senate meeting
- April 13-14 School of Government and Business Administration and Elliott School of International Affairs Master's Comprehensive Examinations

\* The registration procedure and the hours of registration are stated in the *Schedule of Classes*, which is available in advance of each semester.



- April 14 Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
- April 15 Honors Convocation
- April 16 Master's theses due from all May candidates except those in the Elliott School of International Affairs
- April 19 All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
- April 27 Last day of spring semester classes  
Master's theses due from May candidates in the Elliott School of International Affairs
- May 1-10 Examination period
- May 4 Faculty Senate meeting
- May 13 Commencement
- May 17 Board of Trustees meeting



## FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	10,048 full-time; 6,912 part-time
Geographical Origin of Students	50 states, the District of Columbia, and more than 100 countries
1989-90 Tuition	Full-time entering undergraduates (per semester), \$5,750; full-time returning undergraduates (per semester), \$5,265; all part-time and graduate students (per credit hour), \$403 (see pages 27-31)
Number of Full-time Faculty	1,218 (91% with doctoral degrees)
Number of Part-time Faculty	557 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately \$5,360 to \$6,280 for the academic year (see page 57)

*Undergraduate majors:* Accountancy, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer and Information Systems, Computer Science, Criminal Justice, Dance, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, Emergency Medical Services, English Literature, Environmental Studies, Exercise and Sport Science, Fine Arts, French Language and Literature, Geography, Geology, Germanic Languages and Literatures, History, Human Services, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Literature in English, Mathematics, Mechanical Engineering, Medical Record Administration, Medical Technology, Music, Nursing Anesthesia, Philosophy, Physician Assistant, Physics, Political Communication, Political Science, Psychology, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech and Hearing Science, Statistics, Systems Analysis and Engineering, Theatre, Zoology

*Study leading to graduate or professional degrees is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the Elliott School of International Affairs.*



## THE UNIVERSITY

### HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.



## PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "the aspirations of Washington, Jefferson and Madison, for the erection of a university at the seat of the Federal Government." Over the years it has been the aim to develop the University ideal in the nation's capital with a view toward meeting the changing needs of society while continuing to pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all the resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to one of the principal capitals of the world. It is a primary objective of the University to utilize its historical, geographical, and functional relationship to the nation's capital and the Washington community in continuing the development of a great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge to develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian, and coeducational.

Admission to the University is determined only in terms of the personal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of the University.

Expansion of graduate and professional studies and research and the utilization for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of the University's educational program.

The provision of superior instruction and facilities and the application of high standards of entrance qualifications and academic achievement to all students whether full-time or part-time, on-campus or off-campus, are major missions of the University.

A balanced program of student extracurricular activities is an integral part of the University program.

The University will continue to strive to meet the evident needs of an enlarged student body while governing the size of enrollment by its capacity to supply adequate staff and facilities for the excellent teaching and research that it espouses.

## THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes nine colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences*\* offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Music. The College also provides prelegal and premedical programs.

*The Graduate School of Arts and Sciences*† offers advanced study and research leading to the degrees of Master of Arts, Master of Fine Arts, Master of

\* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering programs leading to the joint degrees of Master of Science-Doctor of Medicine and Doctor of Medicine-Doctor of Philosophy.



Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, and Doctor of Philosophy. Some degree programs are available off campus and administered by the Division of Continuing Education.

The *School of Medicine and Health Sciences* offers work leading to the degrees of Associate in Science, Bachelor of Science, Bachelor of Science in Health Science, Master of Public Health, and Doctor of Medicine.

The *National Law Center*\* offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science and special programs in continuing legal education.

The *School of Engineering and Applied Science* offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, computer science, electrical engineering, mechanical engineering, and systems analysis and engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the Division of Continuing Education.

The *School of Education and Human Development* offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies and graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Master of Education, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education and Human Development is also available through off-campus programs administered by the Division of Continuing Education.

The *School of Government and Business Administration* offers undergraduate programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration and graduate programs leading to the degrees of Master of Accountancy, Master of Association Management, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Taxation, Master of Urban and Regional Planning, Specialist in Health Services Administration, and Doctor of Philosophy.

The *Elliott School of International Affairs* offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts.

The *Division of Continuing Education* assists in providing continuing education programs for adult students by administering or coordinating the off-campus credit offerings of the colleges and schools of the University, at both the undergraduate and graduate levels. Noncredit courses are also offered through the Division.

## ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Board.

\* The National Law Center cooperates with the Elliott School of International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering programs leading to joint Juris Doctor and master's degrees.



The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association. The School of Medicine and Health Sciences has had continuous approval by its accrediting body, which is currently the Liaison Committee on Medical Education, sponsored jointly by the American Medical Association and the Association of American Medical Colleges. All undergraduate engineering curricula, including the computer engineering option, of the School of Engineering and Applied Science are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The computer science curriculum is accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board. The School of Education and Human Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its eligible bachelor's, master's, and doctoral degree programs; the School's counseling programs are accredited by the Council for the Accreditation of Counseling and Related Educational Programs and the Council on Rehabilitation Education. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business; the Assembly accredited its undergraduate program in 1977 and its master's program in 1982. The programs in accountancy satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Public Administration program is on the approved list of the National Association of Schools of Public Affairs and Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planning Association. The Master of Association Management degree program is recognized by the American Society of Association Executives. The Department of Chemistry is on the approved list of the American Chemical Society. The Department of Music is an accredited member of the National Association of Schools of Music. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The graduate program in speech-language pathology and audiology is accredited by the Education and Training Board of the Boards of Examiners in Speech-Language Pathology and Audiology.

#### UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to education programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Susan B. Kaplan, Special Assistant to the President, George Washington University, Washington, D.C. 20052, (202) 994-6500, or to the Assistant Secretary for Civil Rights of the U.S. Department of Education.



## LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

## THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,500,000 volumes. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries hold about 17,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic databases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on inter-library loan from other libraries in the city, throughout the United States, and in various other countries.

## THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

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 Vicki J. Baker, M.A., Assistant Treasurer, Student Financial Aid and  
 Cashier  
 Robert Emmett Dickman, M.B.A., Assistant Treasurer, Facilities  
 Margaret Payne Greene, B.S., Assistant Treasurer, Sponsored Programs  
 Donald A. Runyon, M.Ed., Assistant Treasurer, Business and Procurement  
 Affairs  
 Gearldean L. Wynkoop, M.A., Assistant Treasurer, Cash Management and  
 Banking  
 Roderick Stuart French, Ph.D., Vice President for Academic Affairs  
 Carl James Lange, Ph.D., Vice President for Research  
 Ted J. Christensen, M.S., Assistant Vice President for Television  
 Anthony George Coates, Ph.D., Assistant Vice President for Academic  
 Affairs  
 Annie Brittian Wooldridge, B.S., Assistant Vice President for Faculty  
 Personnel  
 George Edgar Jones, M.B.A., Ed.D., Special Assistant to the Vice President for  
 Academic Affairs  
 Michael J. Worth, Ph.D., Vice President for Development and University  
 Relations  
 Dina Dorich, M.A., Assistant Vice President for University Relations  
 Richard Thomas Haskins, M.A., Assistant Vice President for Development

- 
- Steve Bilsky, M.S., Director of Athletics and Recreation  
 James Eugene Clifford, B.S., Director of Personnel Services  
 Margaret Kahn Cohen, M.A., Director of Institutional Research  
 E. Donald Driver, M.B.A., Director of International Student Services  
 J. Matthew Gaglione, B.S., Registrar  
 Ronald W. Howard, B.A., Director of Alumni Relations  
 Robert Gean Jones, B.D., Ph.D., University Marshal  
 Isabel Kuperschmit, M.D., Director of the Student Health Service  
 Michael N. Peller, Director of the Smith Center  
 Sharon J. Rogers, M.L.S., Ph.D., University Librarian  
 Robert DeHaven Shoup, B.B.A., Director of the Budget  
 George William Gustav Stoner, M.A., Director of Admissions  
 LeNorman J. Strong, M.S., Director of the Office of Campus Life  
 Ann Elisabeth Webster, M.A., Director of Housing and Residence Life



**The College, Schools, and Divisions**

- Robert Wayne Kenny, Ph.D., Acting Dean of Columbian College of Arts and Sciences
- Henry Solomon, Ph.D., Dean of the Graduate School of Arts and Sciences
- Philip Stanley Birnbaum, M.S. in M.E., Dean of the Medical Center, for Administrative Affairs
- Lawrence Thompson Bowles, M.D., Ph.D., Dean of the Medical Center, for Academic Affairs
- John C. LaRosa, M.D., Dean of the Medical Center, for Clinical Affairs
- Jack A. Friedenthal, J.D., Dean of the National Law Center
- Harold Liebowitz, D.Ae.E., Dean of the School of Engineering and Applied Science
- Leo D. Leonard, Ed.D., Dean of the School of Education and Human Development
- Ben Burdetsky, Ph.D., Acting Dean of the School of Government and Business Administration
- Maurice Alden East, Ph.D., Dean of the Elliott School of International Affairs
- Carol Holden, Ph.D., Dean of the Division of Continuing Education
- Joseph John Cordes, Ph.D., Associate Dean of Columbian College of Arts and Sciences, for Faculty Affairs and Programs
- David Willard McAleavey, Ph.D., Associate Dean of Columbian College of Arts and Sciences, for Student Services
- Edward Alan Caress, Ph.D., Associate Dean of the Graduate School of Arts and Sciences
- Michael John Jackson, Ph.D., Associate Dean of the Medical Center, for Research
- Robert Keimowitz, M.S., M.D., Associate Dean of the Medical Center, for Student Affairs and Admissions
- Robert Dean Lindeman, M.D., Associate Dean of the Medical Center, for Veterans Hospital Affairs
- Thomas Eugene Piemme, M.D., Associate Dean of the Medical Center, for Continuing Medical Education
- Winfield Harker Scott, Ph.D., Associate Dean of the Medical Center, for Education; Director of Education
- Teresa Moran Schwartz, J.D., Associate Dean of the National Law Center, for Academic Affairs
- John Smith Jenkins, J.D., M.A., Associate Dean of the National Law Center, for Administrative Affairs
- James Elmer Feir, Ph.D., Associate Dean of the School of Engineering and Applied Science
- Jay R. Shotel, Ed.D., Associate Dean of the School of Education and Human Development
- Michael Mont Harmon, Ph.D., Acting Associate Dean of the School of Government and Business Administration
- Henry Nau, Ph.D., Associate Dean of the Elliott School of International Affairs
- Norayr Krikor Khatcheressian, Ph.D., Assistant Dean of Columbian College of Arts and Sciences, for Student Services
- Avery DeLano Andrews, Ph.D., Assistant Dean of the Graduate School of Arts and Sciences
- Charles Edward Rice, Ph.D., Assistant Dean of the Graduate School of Arts and Sciences



- David Alton Rowley, Ph.D., Assistant Dean of the Graduate School of Arts and Sciences
- Jarrett Michael Wise, B.S., Assistant Dean in the School of Medicine and Health Sciences
- Robert V. Stanek, J.D., Assistant Dean of the National Law Center; Director of Admissions (J.D. Program)
- Marlana R. Valdez, J.D., Assistant Dean of the National Law Center, for Student and Administrative Affairs
- Paul Bernard Malone III, D.B.A., Assistant Dean of the School of Government and Business Administration, for Graduate Programs
- Marvin Stewart Katzman, D.B.A., Assistant Dean of the School of Government and Business Administration, for Undergraduate Programs
- Billie Jo Moreland, Ed.D., Assistant Dean of the Division of Continuing Education
- Gayle E. Schou, Ed.D., Assistant Dean of the Division of Continuing Education
- Robert H. Shumaker, D.Sc., Assistant Dean of the Division of Continuing Education
- Abbie O. Smith, Ed.D., Assistant Dean of the Division of Continuing Education

#### COMMITTEES OF THE UNIVERSITY 1988-89

**Committee on the Judicial System:** G.W. Smith (Chair), M.A. Burns, O. Seavey, three student members

**Committee on Religious Life:** R.E. Kennedy, Jr. (Chair), E.A. Fisher, R.A. Lavine, P.B. Malone, M.D. Ticktin, H.E. Yeide, L.J. Strong (*ex officio*), R.E. Dickman (*ex officio*), W. Crawford (*ex officio*), five student members

**Committee on Student Publications:** E.J. Englander (Chair), C.B. Craver, J.J. Jackson, M. Kanda, D.S. Lee, B. Nolan, L.A. Panyon, S.A. Quitslund, D. Moshavi (*ex officio*), eight student members

**Committee on the University Bookstore:** C.H. Sterling (Chair), R. Dale, M. Gupta, three student members

**Committee on Research:** H. Solomon (Chair), M.A. Atkin, D.E. Johnson, C.J. Lange, D.R. Lehman, K.E. Newcomer, M.N. Rashid, L.F. Robinson, N.D. Singpurwalla, C.T. Stewart, D.G. White, C.A. Garriss, M. Jackson (*ex officio*), R.S. French (*ex officio*)

**Committee on Sponsored Research:** E.A. Caress, B.H. Herman, C.W. Linebaugh, A.J. Mastro, T.M. Phillips, G.C. Rosenquist, C.A. Garriss, M. Jackson (*ex officio*), C.J. Lange (*ex officio*), A.E. Parrish (*ex officio*), six student members

**Committee on Research on Humans:** E. Abravanel (Chair), J.W. Hillis, C.J. Lange, P.H.M. Lengermann, A.E. Parrish, P.J. Poppen, M.N. Rashid, S.E. Steinbach (representative of the American Council on Education), P.W. Wirtz, C.A. Garriss

**Committee on Hazardous Materials:** C.E. O'Rear (Chair), H.R. Brasse, R.F. Burch, C.W. Goode, J.L. Lake, R. Lindholm, G.W. McIntyre, N. Mohlmann, R. Packer, D. Ramaker, W.D. Sloan, Jr., C.J. Lange (*ex officio*)

**Committee on Institutional Animal Care and Use:** L.L. Gallo (Chair), J. Albright, E.W. Bradley, A.R. Evans, M. Jackson, J. Kramer, C.J. Lange, M. Olding, R. Packer, L.A. Rothblat, J. Straw, B.C. Zook, R. Hitzelberg (*ex officio*)



**Committee on Academic Oversight for Athletics:** E.A. Caress, J.E. Feir, M.S. Katzman, D. McAleavey, R. Rycroft, J.R. Shotel, S. Bilsky (*ex officio*), S. Hoben (*ex officio*), M.J. Warner (*ex officio*)

**Committee on University Parking:** M.R. Phelps (*Chair*), M.M. Barch, J.E. Clifford, J.B. Levy, B.W. Sabelli, C.E. Diehl (*ex officio*), J. Mello (*ex officio*), D. Runyon (*ex officio*), four student members

**Committee on Campus Security:** M.J. Warner (*Chair*), C.J. Herber, D.M. Hirabayashi, H.H. Hobbs, J.S. Jenkins, P.M. Kelley, C.J. Lange, D.H. McElveen, R.E. Dickman (*ex officio*), C.W. Goode (*ex officio*), three student members

#### THE FACULTY SENATE 1988-89

Simon Ya Berkovich  
 \*Philip Stanley Birnbaum  
 \*Ben Burdetsky  
 James Franklin Burks  
 Jonathan Chaves  
 John Cibinic, Jr.  
 Victor Hugo Cohn  
 Christopher James Deering  
 Salvatore Frank Divita  
 \*Maurice Alden East  
 Mervyn L. Elgart  
 Raymond Richard Fox  
 \*Roderick Stuart French  
 \*Jack A. Friedenthal  
 \*John Matthew Gaglione  
 Charles Alexander Garris  
 William Byron Griffith  
 Phillip Donald Grub  
 \*Robert Wayne Kenny

Arthur David Kirsch  
 \*Leo D. Leonard  
 \*Harold Liebowitz  
 Dorothy Adele Moore  
 John Andrew Morgan, Jr.  
 William H. Painter  
 Salvatore Rocco Paratore  
 Robert Eugene Park  
 Alvin Edward Parrish  
 Francisco Prats  
 Philip Robbins  
 †Lilien Filipovitch Robinson  
 Stefan Otto Schiff  
 George Wilson Smith  
 \*Henry Solomon  
 Susan J. Tolchin  
 \*Stephen Joel Trachtenberg  
 Anthony Marvin Yezer

Roger E. Schechter, *Parliamentarian*

\* *Ex officio* member

† Chairman of the Executive Committee



## ADMISSIONS

The University is coeducational and accepts applications for admission at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a \$45 application fee.\* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester or summer session for which they seek admission. Specific dates are given in each section below.

Acceptance is based on available space and evidence of potential for successful study. The following criteria are considered: degree or major objective related to rigor of program and grades achieved in secondary school or previous college, standardized test scores, relationship between grades and test scores, and recommendations.

The University reserves the right to refuse admission to any student with an academic record that indicates doubtful ability to succeed in college. In the evaluation process, there is no discrimination on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status.

### UNDERGRADUATE ADMISSION†

Application forms for admission or readmission to undergraduate or nondegree status are available from and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

#### Secondary School Students

Applicants who wish to begin college in a summer session or in the fall semester should apply during the fall term of the senior year in high school. Preference for places in the entering class will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Applicants from secondary schools must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

**Entrance Examinations**—Applicants from secondary schools must submit scores on the College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test (SAT) or on the American College Testing (ACT) battery. Score reports must be sent directly to the Office of Admissions from the testing agency.

**Early Notification**—Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after November 1 to students whose applications become complete with secondary school records through the junior

\* Application fee must be by check or postal money order, payable to The George Washington University.

† For detailed admission requirements, see the appropriate college or school in this Bulletin. See pages 24–25 for admission requirements for students from foreign institutions.



year and junior-year test scores, provided these records include the proposed senior-year program and clearly establish admissibility.

**Early Admission Plan**—Exceptionally well-prepared students who have completed the junior year in high school may apply for early admission. This plan is designed for students with the emotional maturity, as well as the academic ability and background, necessary for college entrance. In most cases, applicants accepted for early admission have exhausted academic offerings in secondary school to the extent that remaining for the senior year is not in the best interests of the students or their schools.

To be considered for early admission, students must

1. demonstrate superior academic performance through the junior year of high school;
2. meet the entrance requirements of the college or division applied to, by completing all required entrance units with the possible exception of the fourth year of English;
3. have the unqualified recommendation of the secondary school principal or counselor;
4. submit two letters of recommendation (in addition to the counselor's) from teachers who can testify to the student's maturity and general readiness to enter college;
5. submit a letter from a parent or guardian supporting early college entrance;
6. arrange to have SAT or ACT scores sent directly to the Office of Admissions by the testing agency;
7. take the College Board Achievement Tests in English composition and mathematics and one other Achievement Test (of the student's choice) and arrange to have the scores sent directly to the Office of Admissions by the testing agency.

### Transfer Students

Undergraduate students from other institutions should submit applications and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions.

To be accepted for transfer, a student must be in good standing as to scholarship and conduct at all postsecondary institutions previously attended. A student who has been academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher education must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, even if credits were not earned.

If an applicant has fewer than 30 semester hours of acceptable work (C or better in transferable academic courses from an accredited institution) at the time the application is submitted, his or her high school record and College Board or ACT test scores must be sent to the Office of Admissions directly from the high school and testing agency.

### Advance Tuition Deposit

After notification of acceptance, a \$200 advance tuition deposit will be required of all full-time undergraduate students, including those readmitted. This deposit is not due until May 1 for students entering in the fall semester or until December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.



## Advanced Standing and Advanced Placement

### CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved, either through course work or examination, credit may be granted for work successfully completed at other institutions of higher learning. Assignment of transfer credit will depend on the appropriateness of the courses completed elsewhere, the standing of the institution at which the previous work was completed, and the regulations of the division of this University in which the credit is to be applied toward a degree. Transfer credit must satisfy the requirements for the degree sought as stated in this *Bulletin*. Credit may be accepted provisionally or may require validation by examination or completion of higher-level courses in the same sequence. Transfer credit will not be assigned for courses completed with a low-pass grade (D or the equivalent); course work completed in vocational/technical programs (e.g., secretarial studies); sub-freshman-level remedial work.

In Columbian College, credit assigned for professional courses (those in engineering, education, or business) is limited to 9 semester hours. In the School of Government and Business Administration, there is a limitation of three semester hours per course to be assigned for work completed at another institution; students transferring to that school from two-year colleges will receive no more than 60 semester hours of credit to be applied to degree programs at this University. Columbian College of Arts and Sciences and the Elliott School of International Affairs accept a maximum of 66 semester hours of credit from two-year colleges. The School of Education and Human Development will accept no more than 63 semester hours of such credit.

All transfer students must satisfy the residence and course requirements for degrees sought at this University.

### CREDIT BY EXAMINATION, FROM SERVICE SCHOOLS, FROM NONCOLLEGIATE ORGANIZATIONS, AND BY NONTRADITIONAL METHODS

Assuming there is no duplication of course work, a maximum of 30 semester hours of credit may be assigned upon admission to the University for any combination of the following except as noted below.

**College Board Advanced Placement (AP) Tests**—On the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request, undergraduate credit is assigned for scores of four or five on all Advanced Placement Tests except the test in Studio Art, for which no credit is awarded. Test scores below four are not accepted for assignment of academic credit. The Advanced Placement Tests are administered in the secondary schools in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Board, Advanced Placement Tests, CN 6671, Princeton, N.J. 08541-6671.

**College Board College-Level Examination Program (CLEP)**—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: English composition, humanities, mathematics, natural sciences, and social sciences and history. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in 30 subjects.



Credit is assigned for the General Examinations, with the exception of the English composition examination, passed at approximately the 50th percentile or above.

Credit is assigned, with some exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy.\* A student registered in a degree program at this University must seek departmental and dean's approval prior to taking a CLEP Subject Examination for credit to be applied toward the degree. Credit may not be earned by passing the examination after having taken an equivalent course. Arrangements for the examinations are the responsibility of the student and should be made with the College Board College-Level Examination Program, CN 6601, Princeton, N.J. 08541-6601.

*Special Departmental Examinations for Undergraduates*—Credit may be assigned for Special Departmental Examinations administered by Columbian College departments to students enrolled in all undergraduate divisions of the University; see page 73.

*Credit Earned Through USAFI and DANTES*—Except to students enrolled in the School of Government and Business Administration, credit is assigned for approved United States Armed Forces Institute (USAFI) and Defense Activity for Nontraditional Education Support (DANTES) courses.

*Credit from Service Schools*—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected service school courses. Students seeking such credit should consult the Office of Admissions.

*Credit for Courses Offered by Noncollegiate Organizations*—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses offered by noncollegiate organizations. The University accepts some recommendations published in the *National Guide to Credit Recommended for Noncollegiate Courses*. Students who wish to know whether courses offered by their employers can be considered for credit should inquire at the Office of Admissions. Courses containing fewer than 30 hours of class instruction are not reviewed. Records, which vary with the sponsoring organization, will be required.

*Credit for Courses Offered Through Correspondence and Television*—Except to undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses taught by nontraditional methods, provided that such courses require the student's physical presence during a monitored final examination. Assignment of such credit will require a statement from the sponsoring agency that such an examination was a required part of the course.

#### ADVANCED PLACEMENT OR WAIVER BY EXAMINATION

Advanced placement or waiver of a requirement will be granted on the basis of scores on Achievement Tests of the College Board as follows:

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
European and/or American History	600	Waives Hist 39-40 and/or 71-72

\* See page 128 for specific restrictions on CLEP credit for applicants to the School of Government and Business Administration.



French	650	} Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

A score of 58 or above on the SAT Test of Standard Written English, or a score of 28 or above on the ACT English Usage Test, will waive English 10.

Advanced standing (academic credit) is not assigned on the basis of SAT, ACT, or Achievement Test results.

### GRADUATE ADMISSION\*

*Graduate School of Arts and Sciences*—Application forms for admission or readmission are available at the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052. Completed applications and requests for fellowship support must be submitted by the dates indicated on the Graduate School's application information. Applications for graduate study without fellowship support must be received by July 1 for the fall semester, by November 1 for the spring semester, and by April 15 for the summer session, unless otherwise noted on the Graduate School's application information.

*School of Education and Human Development*—Application forms for admission or readmission are available at the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052. Completed application forms should be submitted to that office no later than June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions, unless an extension is granted by the office of the dean.

*School of Government and Business Administration*—Application forms for admission or readmission are available at the Office of Enrollment Development and Admissions, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. The Application for Graduate Degree Candidacy shows the deadlines for applications to the graduate programs offered by this school.

*Elliott School of International Affairs*—Application forms for admission or readmission are available at the Graduate Admissions Office, Elliott School of International Affairs, George Washington University, Washington, D.C. 20052. Completed application forms should be submitted to that office no later than February 1 (January 15 for foreign applicants and applicants for graduate fellowship or assistantships). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores, and letters of reference, must be received before the deadline date.

### DIVISION OF CONTINUING EDUCATION

The Office of University Students in the Division of Continuing Education makes on-campus credit courses available to nondegree students. Application forms for admission to nondegree status in this Division are available from and should be returned to the Office of Admissions, George Washington University, Washing-

\* For detailed admission requirements, see the appropriate school in this *Bulletin*.



ton, D.C. 20052. Completed application forms and any credentials required should be received by the Office of Admissions no later than the Friday before the first day of registration (see Calendar, page 5). To avoid paying a late registration fee, applicants should make sure that all necessary forms and credentials are in the Office of Admissions prior to registration. There is no fee for applying to this Division. For detailed entrance requirements, see page 169.

Students in this Division may not take accountancy, business administration, or management science courses; registration in other courses may be denied students in nondegree status when space is needed for degree students.

With the exception of the School of Government and Business Administration, which limits a student to 15 semester hours earned in nonmatriculated status, a maximum of 45 semester hours earned in the Division of Continuing Education may be applied toward a bachelor's degree in the other undergraduate degree-granting colleges or schools of the University.

### READMISSION

Previously registered students who wish to resume studies on campus after discontinuing enrollment for one or more semesters (summer sessions excluded) must apply for readmission. Deadlines for readmission applications from students in good academic standing are the same as those for new applications (see pages 19–20 and 23–24). Students who discontinued enrollment while on academic probation or under suspension should allow at least one month for appropriate processing of readmission credentials. Students seeking readmission after having attended other institutions of higher education in the interim must have complete official transcripts sent to the appropriate office at this University from all other institutions attended. Students seeking readmission as degree candidates after previous enrollment in nondegree status must submit a standard undergraduate degree application and fee, together with all entrance credentials not previously received or required.

Applicants for readmission are subject to the University regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission after previous enrollment as degree candidates at this University if they have not since registered as degree candidates at another institution.

### STUDENTS FROM FOREIGN INSTITUTIONS\*

Applications, required records, and scores on the Test of English as a Foreign Language (see below) should be received from international students no later than March 1 (February 1 for some graduate programs) for the fall semester and October 1 for the spring semester.

#### Required Records

At the time the application is sent, students must have the educational institutions previously attended send directly to the appropriate admissions office (see Undergraduate Admission, pages 19–20, or Graduate Admission, pages 23–24) copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended

\* For detailed admission requirements, see the appropriate college or school in this Bulletin.



are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation.

### **Language Tests**

Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Students are responsible for making arrangements to take the test by addressing inquiries to TOEFL, CN 6151, Princeton, N.J. 08541-6151. The completed registration form must be returned well in advance of the semester for which admission is sought. On the application for the TOEFL, students should specify that the scores are to be sent to the appropriate admissions office at this University. Registration for the TOEFL does not constitute application for admission to George Washington University.

Admitted students whose native language is not English are also required to take an English as a Foreign Language placement test prior to registering at the University. Depending on the results of this test, the student's academic program may be restricted in number and type of courses that can be taken. (See page 124 for policy governing international students newly admitted to the School of Government and Business Administration.) College credit is not granted for English study below the level of standard freshman English courses.

### **Financial Certificate**

A Financial Certificate must be completed and submitted with the application for admission of all international students planning to study at the University under the authorization of either a student (F) or exchange visitor (J) visa. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66.

### **TRANSFER WITHIN THE UNIVERSITY**

For information concerning transfer from one college, school, or division to another within the University, see page 48.



## REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, prior to registration. Registration is not complete until all financial obligations have been met.

### Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar and published in the *Schedule of Classes*. A student who is suspended or whose record is not clear for any reason is not eligible to register. Registration in a given course may be denied students in the Division of Continuing Education when space is needed for degree candidates.

**New Student**—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

**Readmitted Student**—A student previously registered in the University who was not registered on campus during the preceding semester must apply for and be granted readmission by the appropriate admitting office before he or she is eligible for registration.

**Continuing Student**—A student registered on campus in the immediately preceding semester or the summer session preceding the fall semester is eligible to register assuming good standing and enrollment in a continuing program.

### Completion of Registration

Registration is not complete until financial obligations have been fulfilled. Attendance in class is not permitted until registration has been completed.

### Program Adjustment (Add/Drop)

The program adjustment period begins the first day of classes. Program adjustment requires the approval of the advisor, department, and dean concerned.

### Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. (see page 52), should consult the program announcements of the other institutions. Consortium registration forms and instructions may be picked up in the Office of the Registrar. In order to participate in the Consortium program, students must obtain the approval of an advisor and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar.



FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1989 summer sessions and the academic year 1989-90.

Tuition Fees

For undergraduate and graduate study in Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, the Elliott School of International Affairs, and the Division of Continuing Education:

ON-CAMPUS PROGRAMS

Full-time undergraduate program (12-17 credit hours)*	
Entering students, per semester.....	\$5,750
Returning students, per semester .....	5,265
Part-time undergraduate program (fewer than 12 credit hours)	
All students, per credit hour.....	403
Graduate program, all students, per credit hour.....	403
Summer sessions, all students, per credit hour.....	358
Entering students, SGBA doctoral program, for the entire degree program, to be paid in 10 semiannual installments .....	27,370

OFF-CAMPUS PROGRAMS

All programs (except Crystal City Education Center), per credit hour	265
Crystal City (except Public Administration), per credit hour.....	312
Public Administration courses at Crystal City, per credit hour.....	403

- Registration Fee** (charged all students)—\$25 per registration†
- Marvin Center Fee** (charged all students registered on campus)—\$10.75 per credit hour, to a maximum of \$112.50 per semester
- Additional Course Fees**—In certain courses additional fees, such as laboratory and material fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.
- Computer Usage Fees** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is \$100 for any semester.
- Residence Hall Fees** (see page 57)
- Graduation Fee** (charged all students applying for graduation)—\$75

\*Undergraduates taking more than 17 credit hours per semester will be charged at the rate of 1 credit hour (\$403) for each credit exceeding that limit.  
†One registration fee of \$25 covers all summer sessions per year.



**Special Fees and Deposits**

Application fee (all degree candidates), nonrefundable . . . . .	45.00
Advance tuition deposit, nonrefundable, charged each entering or re-admitted full-time undergraduate student . . . . .	200.00
Housing deposit, nonrefundable, charged each applicant for residence hall space . . . . .	300.00
Late-registration fee, for failure to register within the designated period (charged on-campus students only):	
During first week of classes . . . . .	50.00
After first week of classes . . . . .	100.00
Late-payment fee (see Payment of Fees, below) . . . . .	15.00
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) . . . . .	35.00
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) . . . . .	15.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason . . . . .	15.00
Binding master's thesis . . . . .	15.00
Microfilm service and printing announcement of final examination (doctoral candidates) . . . . .	75.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both. . . . .	50.00
Waiver examination to qualify for advanced placement. . . . .	20.00
English test for international students (when required) . . . . .	15.00
Laboratory check-out fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor (a student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period) . . . . .	10.00
Charles E. Smith Center fee (for off-campus degree candidates only):	
Students registered as degree candidates in a program offered through the Division of Continuing Education may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from the Division a signed certificate attesting to degree candidacy . . . . .	50.00
Statement issued by the Department of Romance Languages and Literatures certifying the degree of oral and/or written fluency and command of the French, Italian, Portuguese, or Spanish languages . . . . .	25.00
Transcript fee . . . . .	2.00
Replacement of lost or stolen picture identification card . . . . .	5.00

Payment of tuition for thesis or dissertation research entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis or dissertation is to be written. In case a thesis or dissertation is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the use of the University library; (2) the



services of the Career Services Center; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) the *Hatchet*, the student newspaper. These privileges terminate when the student withdraws or is dismissed from the University.

### Postdoctoral Study

Those who have graduated from George Washington University with a Ph.D., Ed.D., D.Sc., D.B.A., or D.P.A. may continue any studies in the University without payment of tuition (contingent upon the availability of space) and may enjoy all University library privileges. Such graduates are required to pay a nominal fee based on the prevailing credit hour rate for one semester hour, as well as the Marvin Center fee, in order to establish their active membership in the University. The use of laboratory space and equipment is contingent upon availability, and the cost of all laboratory or special library material is paid by the graduate. Special arrangements for such privileges must be made with the dean two months in advance of the semester in which the graduate wishes to register. Postdoctoral work taken under this privilege may not be taken for credit.

### Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 12 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by \$2,000 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a \$15 late-payment fee and will be subject to the interest charge of 12 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of \$35 for on-campus students and \$15 for off-campus



students. Accounts that must be referred to a collection service will be assessed all collection costs, including fees charged by the collection agency.

Students auditing courses are subject to all fees charged to students registered for credit.

**Returned Check Policy**—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

**GWU Monthly Payment Plan**—The University's Monthly Payment Plan is available to all students. Upon receipt of the appropriate application, the University will establish an account and mail payment coupons and envelopes for use to ensure proper credit of payments. The plan covers an academic year (excluding summer sessions) and requires ten monthly payments, May through February. Payments must be received by the 10th of each month. If a decision is made after May to use this plan, all missed payments must be made to bring the account current to the time participation is initiated. There is no charge and no interest for using the plan if all payments are made as scheduled.

**Commercial Prepaid and Deferred Payment Plans**—Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899  
Knight Insured Tuition Payment Plan, 855 Boylston Street, Boston, Mass. 02116  
School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007  
Educational Loan Program, The Riggs National Bank, 1120 Vermont Ave., N.W., Washington, D.C. 20005  
The Tuition Plan, Inc., 57 Regional Drive, Concord, N.H. 03301

### Off-Campus Courses

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a credit course lasting 13 weeks or longer may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by October 3, and one-third by November 3 (for the fall semester); one-third at the time of registration, one-third by February 7, and one-third by March 6 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks and for all noncredit courses are payable in full at registration.

### Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see Withdrawal, page 47). Financial aid recipients must notify the Office of Student Financial Aid in writing. No refund of the \$200 tuition deposit required of entering students is granted.



In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal from all courses (on-campus students):*

Withdrawal dated on or before Friday of the first week of classes . . . . .	80%
Withdrawal dated on or before Friday of the second week of classes . . . . .	60%
Withdrawal dated on or before Friday of the third week of classes . . . . .	40%
Withdrawal dated on or before Friday of the fourth week of classes . . . . .	25%
Withdrawal dated after the fourth week of classes . . . . .	None
  2. *Partial withdrawal:* If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.
  3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
  4. *Summer Sessions:* In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.
  5. *Refund Schedule for Off-Campus Registration:*

After the first class meeting but before the third class meeting . . . . .	80%
After the third class meeting but before the fifth class meeting . . . . .	50%
After the fifth class meeting . . . . .	None
- No refund will be made for sessions of less than 21 days.

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Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education. Federal regulations require that financial aid recipients use such refunds to repay financial aid received for that semester's attendance. This policy applies to institutional aid as well.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.



## FINANCIAL AID

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment based on academic achievement and demonstrated financial need. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. All undergraduate gift aid (institutional scholarships and grants and federal grants) requires that the student be working on the first undergraduate degree. Undergraduate gift aid requires that the recipient be registered for a full-time course load at GWU. Loans and resident assistantships not based on financial need are available to undergraduates and graduates alike. In general, consideration for financial aid is restricted to students in good academic standing who meet the minimum grade point average for particular awards and are not financially encumbered by any other University office. Applications for institutional or federal aid cannot be processed if the relevant tax returns have not been filed in accordance with the IRS Code. Documents submitted as part of aid applications become the property of the University and cannot be returned. Federal regulations require that the University report suspected cases of fraud or misrepresentation to the appropriate federal, state, and local authorities.

Information on the various programs follows.

### SCHOLARSHIPS AND OTHER FORMS OF AID FOR UNDERGRADUATES

*Honor Scholarships*—George Washington University honor scholarships are up to half-tuition for the academic year, based entirely upon academic achievement and potential without regard to financial need, are restricted to incoming freshmen.

*Need-Based Aid*—The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the Perkins Loan, Pell Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by March 1 (all undergraduate students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.\* A student must reapply for all financial aid, including scholarships, each year; renewal is contingent upon funds being available when the student completes the application.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

The following scholarships are available to students in Columbian College of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the Elliott School of International Affairs.

*The George Washington University Board of Trustees Scholarships*—Full- and partial-tuition scholarships begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadline.

\* Only students who are enrolled in this University for at least 6 semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for summer sessions financial aid.



lines, maintains a B average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree in any school listed above.

### Other Scholarships

- Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship
- Sherman Page Allen Memorial Scholarship Fund (1966)
- Alumni Scholarships
- Mary J. Anderson Scholarship (1969)
- D.F. and J.D. Antonelli Scholarship Fund (1987)
- Athletic Scholarship Fund (1979)
- Byron Andrews Scholarship (1920)
- Sigrid Weeks Benson Scholarship (1987)
- Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
- A.D. Britt Scholarship Fund (1984)
- Mary Ellen Caplin Scholarship (1987)
- Elsie M. Carper Undergraduate Scholarship Fund (1987)
- Emma K. Carr Scholarships (1932)
- Maria M. Carter Scholarship (1871)
- Paul E. Casassa Memorial Foundation Scholarship (1968)
- James Edward Miller Chapman Educational Foundation Scholarship (1984)
- The Chesapeake and Potomac Telephone Company Scholarship (1978)
- Columbian Women Scholarship Funds
- Victoria Briggs Scholarship Fund (1959)
- Elizabeth V. Brown Scholarship Fund (1925)
- Grace Ross Chamberlin Scholarship Fund (1932)
- College Women's Scholarship Fund (1926)
- Columbian Women Members' Scholarship Fund (1961)
- Arline Hughes Dufour Scholarship Fund (1961)
- Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fund (1964)
- Founders of Columbian Women Scholarship Fund (1920)
- Ross Lees Hardy Foundation Scholarship Fund (1957)
- Lillian Young Herron Scholarship Fund (1925)
- Nellie Maynard Knapp Scholarship Fund (1915)
- Marcia B. Kraft Scholarship Fund (1966)
- Janet McWilliams Scholarship Fund (1954)
- Marie-Louise Ralph Turner Scholarship Fund (1963)
- Cora and John H. Davis Scholarship (1987)
- Isaac Davis Scholarship (1869)
- District of Columbia Daughters of the American Revolution Scholarship
- District of Columbia Institute of Certified Public Accountants Scholarship in Accounting (1964)
- Estella Constance Drane Scholarship (1957)
- Vincent J. DeAngelis Scholarship Fund (1983)
- Robert Farnham Scholarship (1871)
- Federal Government Accountants Association—Washington, D.C., Chapter—Scholarship in Accounting
- Esther Brigham Fisher Scholarship (1951)
- Dean James Harold Fox Scholarship (1988)
- Geico Achievement Award (1979)
- George Washington University Tennis Alumni Association Scholarship



Gary C. and Leslie Granoff Scholarship Fund (1986)  
Mildred Green Memorial Scholarship Fund (1959)  
Gridiron Foundation of the Gridiron Club Scholarship (1975)  
Isadore and Bertha Gudelsky Family Scholarship (1978)  
Anna Spicker Hampel Scholarship (1949)  
Theo Campbell Hartman Scholarship (1986)  
Elma Lewis Harvey Scholarship (1921)  
Hazelton Scholarship (1950)  
George F. Henigan Scholarships in Debate (1967)  
Hyundai Scholarship Fund (1983)  
Albert A. and Esther C. Jones Scholarship Fund (1981)  
Allen M. Jones Scholarship Fund (1981)  
David B. and James L. Karrick, Jr., Scholarship Fund (1968)  
Samuel and Elizabeth Kay Scholarships (1969)  
Amos Kendall Scholarship (1869)  
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)  
Thaddeus A. and Mary Jean Lindner Scholarship Fund (1985)  
Calvin D. Linton Endowment Scholarship Fund (1987)  
Mary and Daniel Loughran Scholarship (1976)  
Martha's Marathon Residence Hall Scholarship (1969)  
Maud E. McPherson Scholarship in English and American Literature (1978)  
A. Morehouse Scholarship (1861)  
E. K. Morris Education Fund Scholarships (1972)  
Helen Marie and Thomas E. Orr Scholarships (1965)  
Henry and Caroline Orth Scholarship Fund (1985)  
Thornton Owen Scholarship (1987)  
Pan-Dodecanesian Association of America Scholarship (1979)  
Hardy Pearce Scholarship Fund (1972)  
James and Theodore Pedas Scholarship (1987)  
Phi Delta Gamma Scholarships (1956)  
Fred B. and Alma D. Pletcher Scholarship Fund (1968)  
Levin M. Powell Scholarships (1886)  
Research Assistantships in Operations Research and Related Fields  
Resident Assistantships  
Jack B. Sacks Foundation, Inc., Scholarship (1983)  
Henry Whitefield Samson Scholarship Fund (1966)  
Lula M. Shepard Scholarships (1946)  
Mildred Shott Scholarship Fund (1981)  
Sigma Delta Chi Foundation of Washington, D.C., Scholarships  
Myrna Sislen Guitar Scholarship (1983)  
Margaret Lucille Snoddy Scholarship (1970)  
David Spencer Scholarship (1918)  
George Steiner Scholarship in Music (1985)  
Mary Lowell Stone Scholarship (1893)  
Charles Clinton Swisher Scholarships (1941)  
U.S. Office of Education Traineeships (1964)  
University Players Scholarship in Memory of L. Poe Leggette (1968)  
William Walker Scholarship (1824)  
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)  
John Withington Scholarship (1830)  
Women's Physical Education Alumnae Association Scholarship (1964)  
William G. Woodford Scholarship (1969)  
Ellen Woodhull Scholarship (1919)



Zonta Club Scholarship (1950)

Barbara Jackman Zuckert Scholarship Fund for Blind Part-Time Students

### Grants

**The GWU Grant Program**—Established for needy students who have achieved a C or better average at GWU.

**Other Grants**—The following funds have been established to meet the special needs of disadvantaged students from the District of Columbia inner city and the Washington metropolitan area.

Eugene F. Ford Award (1987)

George Washington University's Educational Opportunity Program Tuition

Grants (1968)

Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)

Marriott Foundation Grant (1968)

### ASSISTANTSHIPS, FELLOWSHIPS, AND OTHER FORMS OF AID FOR GRADUATE STUDENTS

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the dean of the school concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.

#### Assistantships

**Research Assistantships**—May be available in departments with faculty who are participating in sponsored research.

**Graduate Teaching Assistantships**—Available to graduate students in master's and doctoral programs in most departments of the University. A graduate teaching assistant receives financial compensation for a designated unit of service to the assistant's major department of instruction.

**Other Assistantships**—

Health Services Administration Research Assistantships

National League of Cities/George Washington University Assistantship

Urban Affairs Assistantship

#### Fellowships, Internships, Traineeships, Special Programs

The following fellowships, internships, and traineeships are available to students in the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of International Affairs. The University also offers many other fellowships that are available to students in these colleges and schools.

**University Fellowships**—Available to graduate students in master's and doctoral programs in most departments of the University. Fellowships are based on scholarship and each fellow may receive a stipend and/or tuition allowance.

**Research Traineeships**—Available under numerous sponsored programs in a number of departments. Currently, the basic medical science departments and the Departments of Psychology and Speech and Hearing offer such programs. Stipends vary; information is available from the departments.



*Other Fellowships, Internships, Traineeships, and Special Programs—*  
Achievement Rewards for College Scientists (ARCS) Foundation, Inc.,  
Fellowship

Robert A. Aleshire Fellowship Fund (1971)  
American Association of Collegiate Schools of Business Fellowship  
American Civilization Fellowships  
American Civilization Internships (Smithsonian Institution—George Washington  
University Cooperative Program)  
American Iron and Steel Institute Fellowship  
Arthur Anderson & Co. Doctoral Fellowship  
Aryamehr Research Fellowships  
Benjamin Banneker Fellowship for Washington Area Studies  
Bell Atlantic Graduate Fellowship (1987)  
Winfield Scott Blaney Fellowship in International Affairs (1961)  
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning  
Center for Washington Area Studies Fellowship  
Thomas Alva Edison Fellowship  
Elementary Teacher Education Internships  
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics  
Health Services Administration Fellowships  
Richard D. Irwin Doctoral Fellowships  
Marvin L. Kay Fellowship in Finance (1986)  
Rita H. Keller Scholarship Fund (1981)  
Isabella Osborn King Research Fellowships (1927)  
Loula D. Lasker Fellowships in Housing, City Planning, or Urban Renewal  
Morris Louis Fellowship in Painting  
George McCandlish Fellowship in American Literature (1980)  
Mellon Foundation Fellowships  
Minorities in Planning and Related Professions Program  
National Association of Purchasing Management Fellowship  
National Historical Publications Commission—George Washington University  
Cooperative Research Fellowships  
National Science Foundation Graduate Fellowships  
Resources for the Future, Inc., Fellowship Prize  
Rose Bibliography Internships  
Thomas Bradford Sanders Fellowships (1928)  
Scottish Rite Foundation Fellowships  
U.S. Office of Education Fellowships (1964)  
U.S. Public Health Service Traineeships  
U.S. Public Health Service Traineeships in Comprehensive Health Planning  
Urban Studies Fellowships, Department of Housing and Urban Development  
Urban Transportation Center Fellowship  
Ronald Barbour Weintraub Research Fellowship in Biological Sciences (1980)

**Graduate Scholarships**

Armed Forces Health Professions Scholarship Program (The Uniformed Ser-  
vices Health Professions Revitalization Act of 1972—Public Law 92-426)  
William C. Barbee Scholarship in Sculpture (1975)  
Emma K. Carr Scholarships (1932)  
Oliver T. Carr, Jr., Scholarship in Urban and Regional Development (1986)  
James Edward Miller Chapman Educational Foundation Scholarship (1984)  
District of Columbia Institute of Certified Public Accountants Scholarship in  
Accounting (1964)



Frederick H. Gibbs Scholarship in Health Services Administration (1967)  
 Leo and Lillian Goodwin Endowment Scholarship (1986)  
 Bryce Harlow Foundation Scholarship  
 Hyundai Scholarship Fund (1983)  
 Albert A. and Esther C. Jones Scholarship Fund (1981)  
 Allen M. Jones Scholarship Fund (1975)  
 Mary and Daniel Loughran Graduate Scholarship (1976)  
 Foster G. McGaw Scholarship in Health Services Administration (1971)  
 Paul Pearson Scholarship Fund (1940)  
 Phi Delta Gamma Scholarship Fund (1968)  
 Mildred Shott Scholarship Fund (1981)  
 Voorhees Scholarships  
 Wolcott Foundation Scholarships  
 Helen and Sergius Yacobson Graduate Scholarship (1987)

#### **Sponsored Awards for Graduate Study**

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others that may be used in support of graduate study is available at the Gelman Library, 2130 H St., N.W., first floor. Information is also available on distinguished programs, such as the Rhodes, Marshall, National Science Foundation, Fulbright, and Luce, as well as many others.

#### **FORMS OF AID AVAILABLE TO UNDERGRADUATE AND GRADUATE STUDENTS**

##### **Assistantships**

*Resident Assistantships (men and women)*—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes salary and a furnished room for the academic year. All positions are part time, and staff members are required to enroll as full-time students in degree programs. Further information may be obtained from the Office of Housing and Residence Life.

##### **Loan Funds**

The following loan funds are available to undergraduate and/or graduate students in Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the Elliott School of International Affairs. A separate application must be submitted for all loan programs. Applications for the Perkins Loan Program should be filed no later than March 1 (all undergraduates) or April 1 (graduate students) for the following academic year. Complete information is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund  
 George F. Henigan Loan Fund (1975)  
 International Student Loan Fund (1967)  
 Joanne Jacobs Student Loan Fund (1974)  
 W. K. Kellogg Foundation Hospital Administration Loan Fund  
 Jessie B. Martin Loan Fund (1967)



**Perkins Loan Program**

Hiram Miller Stout Memorial Loan Fund (1973)

University Student Emergency Loan Fund

The Edmund W. Dreyfuss Loan Fund (1983)

The Peter and Doris Firsh Loan Fund (1983)

**Stafford Loans (formerly Guaranteed Student Loans)**—George Washington University is an eligible participant in the Stafford Loan Program. Freshmen and sophomores may apply for a maximum of \$2,625 per year; juniors and seniors, a maximum of \$4,000 per year. Graduate students may apply for a maximum of \$7,500 per year. Students who intend to use the loan for payment of tuition at registration should submit an application, as well as all required supporting documents, no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).

**Parent Loan for Undergraduate Students**—George Washington University is also an eligible participant in the Parent Loan for Undergraduate Students Program (PLUS) and the Supplemental Loans for Students (SLS). The interest rate on the loans is variable, based on the interest rate on U.S. Treasury bills, to a maximum of 12%. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate and graduate students may apply for up to \$4,000 per year for each student. Independent undergraduate and graduate students may apply for up to \$4,000 per year on their own behalf. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).

**The CONSERN Loan Program**, jointly sponsored by the District of Columbia and the Consortium of Universities of the Washington Metropolitan Area, provides supplementary aid to creditworthy students and parents who have financial need remaining after having exhausted benefits from all other federal, state, and institutional aid programs for which they qualify (except CWSP, PLUS/SLS, and HEAL). Applicants must be enrolled at least half time and must demonstrate financial need otherwise unmet. CONSERN loans range from \$2,000 up to the cost of education for the academic year and carry a variable interest rate that was 10.33% in 1988.

**Student Employment**

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students. After registration, students may apply at the Career Services Center for interviews and referrals to positions for which they are qualified.

**INTERNATIONAL STUDENTS**

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a B average are eligible to apply for the Board of Trustees Scholarships; those with a C average are eligible to apply for GWU Grants. Aid is awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, above.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned.



International students applying for graduate teaching assistantships must have minimum scores of 570 on the Test of English as a Foreign Language (55 in listening comprehension) and 250 on the Test of Spoken English. International students applying from outside the University may be appointed to graduate teaching assistantships but must attend a five-day orientation and evaluation program held prior to registration. Those found to have difficulties with English will be required to enroll in specified courses in English as a Foreign Language (tuition fees for these courses will be waived) and will be assigned nonteaching duties in place of classroom instruction. Such students will be reevaluated each semester; if they are not designated as qualified to give classroom instruction by the end of one academic year, the teaching assistantship will be withdrawn.

Graduate students who are presently enrolled at GWU and have been proposed as candidates for graduate teaching assistantships by their departments must pass the Test of English as a Foreign Language at the levels indicated above and will be required to complete successfully the English for International Students oral interview and the orientation and evaluation program before they will be considered for graduate teaching assistantships.

For further information on requirements for international teaching assistants, contact the office of the Assistant Vice President for Academic Affairs, Rice Hall, fifth floor, George Washington University, Washington, D.C. 20052.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September–May) was \$16,300 in 1988–1989 and will be substantially higher in 1989–1990; generally speaking, expenses for international students are about \$2,000 over the stated figure, which includes room and board, tuition, books, clothes, and incidental expenses, but not travel, holiday, or medical expenses.

## VETERANS BENEFITS

The Veterans Benefits office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as active-duty personnel, veterans, or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as active-duty personnel, veterans, or dependents of veterans should consult with the veterans counselor prior to submitting applications to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and that includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.



## PRIZES

**Accountancy Prizes**—Three prizes for academic excellence awarded annually by the Department of Accountancy—one at the undergraduate level, one at the Master of Accountancy level, and one at the Master of Taxation level.

**Elizabeth B. Adams Prize**—Awarded annually by the Department of Management Science to a graduating student for outstanding performance in the field of information systems management. The recipient is selected on the basis of scholarship, leadership within the Department, contributions to the University and service to the community.

**Morris M. Aein Memorial Prize**—Awarded to a deserving student for excellence in drawing.

**Alpha Chi Sigma Prize**—Awarded annually by the Alpha Pi Chapter to the student who has attained the highest academic record in courses in chemistry. The name and year of graduation of the student is inscribed on a bronze plaque. The winner must have had at least 16 hours in chemistry, including the final semester, at this University.

**American Chemical Society Prize**—Awarded to an undergraduate student who has completed the junior year and who has demonstrated excellence in analytic chemistry.

**American Institute of Certified Planners Outstanding Student Prize**—Awarded to a qualified candidate for the Master of Urban and Regional Planning who has demonstrated significant service to the community, University and Department, or professional planning community.

**American Institute of Chemists Prize**—A medal awarded annually to the graduating student majoring in chemistry who excels in scholarship, integrity and leadership.

**Amling Prize**—Established by Dr. Frederick Amling in honor of his parents Gustav and Elsie Amling, for the best investment report in Business Administration 123, Investment and Portfolio Management.

**Department of Art Prizes**—Two prizes (one for a senior in art history and one for a senior in the fine arts) awarded annually to the most promising students, as determined by the departmental faculty.

**William C. Barbee Prize**—Awarded to a deserving student for excellence in sculpture and sculptural ceramics.

**Perry Botwin Prize**—Awarded annually to an outstanding senior in the program in special education of the School of Education and Human Development.

**The Walter G. Bryte, Jr., Achievement Award**—Provided by Walter G. Bryte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science at George Washington University. The award is presented annually primarily to that undergraduate residence hall, secondarily to any other activity at the University, that has shown, under the leadership of its elected or designated head, the most improvement or excellence in its support of the principles and aims of the United States of America and George Washington University. The hall or other activity will be awarded a cash prize, and the name of its leader and the hall or activity will be engraved on a silver trophy.

**Buka Family Prize**—Provided by Ruth Buka in honor of her parents, Georg and Rosa Buka, and her sister, Hilde Buka-Lacour. It is awarded to the most outstanding student in the Department of Germanic Languages and Literatures.

**Sylvia L. Bunting Prize**—Awarded annually to a graduate student in the field of biology or zoology.

**Byrne Thurtell Burns Memorial Prize**—Awarded to the senior majoring in chemistry who shows the greatest proficiency in organic chemistry, as evidenced



by a comprehensive examination, and who possesses such qualifications of mind, character, and personality as to give promise of future achievement.

**Business Administration Prize**—Awarded annually by the Business Administration Department to the outstanding graduating senior in business administration on the basis of scholarship, leadership, and service to the University.

**Wilbur J. Carr Prize**—Established in 1962 by Edith K. Carr, former Trustee of the University, in memory of her distinguished husband, who was graduated from the School of Comparative Jurisprudence and Diplomacy in 1899. It is awarded annually to that student in the graduating class of the University who has demonstrated outstanding ability in the study of international affairs and who has given evidence of possessing in marked degree the qualities that produce the good citizen and the dedicated public servant.

**Chemical Rubber Company Freshman Chemistry Achievement Prize**—A Handbook of Chemistry and Physics awarded annually to the freshman student who has demonstrated the greatest achievement in Chemistry 15-16.

**Chemical Society of Washington Prize**—Awarded to an outstanding undergraduate in the junior year who is majoring in chemistry.

**Astere E. Claeysens Prize**—Established in 1981 by the Trustees of the Bess and Arthur Dick Family Foundation. It is awarded for the best original work in playwriting by a student enrolled in the University.

**Bertice Cornish Prize**—Awarded annually to an outstanding student completing a graduate program in special education.

**John Henry Cowles Prizes**—Two prizes, established by John H. Cowles, Grand Commander of the Supreme Council of Thirty-third Degree (Mother Council of the World) of the Ancient and Accepted Scottish Rite of Free-masonry, Southern Jurisdiction of the United States of America. Awarded upon graduation to the graduate or undergraduate student with the best overall scholastic achievement and leadership potential in the School of Government and Business Administration and in the Elliott School of International Affairs.

**DeWitt Clinton Croissant Prize**—Awarded annually to the undergraduate student enrolled in a course in drama or active in University dramatics who submits to the English Department the best essay on drama or the theater.

**E.K. Cutter Prize**—Established by Marion Kendall Cutter "for excellence in the study of English." Awarded to the member of the graduating class whose record in English, combined with general excellence, shows the most marked aptitude for and attainment in English studies.

**Isaac Davis Prizes**—Established in 1847 and awarded annually to the three seniors who have made the greatest progress in public speaking while enrolled in the University. Awards are determined by a public-speaking contest in which the participants deliver original orations. Only members of the senior class of Columbian College of Arts and Sciences who are candidates for the degree of Bachelor of Arts or Bachelor of Science are eligible to compete.

**Henry Grattan Doyle Memorial Prize**—Established in memory of Henry Grattan Doyle, a former Dean of Columbian College. Awarded annually to an outstanding senior for excellence in Spanish.

**Elliott School of International Affairs Alumni Association Prize**—May be awarded annually to a graduate of the Elliott School of International Affairs (graduate or undergraduate degree recipient) who, in the opinion of the Dean and the Faculty, deserves recognition for academic achievement and contribution to the life of the George Washington University and its programs and goals.

**Elton Prize**—Established by the Reverend Romeo Elton, of Exeter, England, and awarded annually to the student with the highest average in the most advanced course in the Greek language and literature.



*Jesse Frederick Essary Prize in Journalism*—Established by Helen Essary Murphy and awarded annually to a student who has given promise of sound citizenship and who submits the best printed and published evidence of ability in "forthright reporting" and good journalistic writing in a student publication or elsewhere.

*Jessie Fant Evans Prize*—A bequest of Joshua Evans, Jr., in 1971, in recognition of his wife's distinguished record at and service to the University, on whose Board of Trustees she served as the first woman member. Awarded annually to an outstanding senior student in a contemporary history course.

*Joshua Evans III Prize in Political and Social Science*—A memorial prize "established by friends because of an outstanding life." Awarded annually to that student in the graduating class "who has demonstrated his/her signal ability in the social and political sciences and who has given promise of the interpretation of that ability in good citizenship among his/her fellows."

*Willie E. Fitch Prize*—Established by James E. Fitch in memory of his son. Awarded annually to a senior student for the best examination in chemistry.

*Charles E. Gauss Prize*—Established in honor of Charles E. Gauss, Elton Professor of Philosophy from 1945 to 1964. Awarded annually to a graduating senior for excellence in philosophy.

*Alice Douglas Goddard Prize*—A memorial established by Frederick Joseph Goddard, of Washington, D.C. Awarded annually to the senior student making the highest average in American literature.

*Edward Carrington Goddard Prize*—Established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Washington, D.C., in memory of Edward Carrington Goddard, class of 1881. Awarded to the junior or senior student making the highest average in French language and literature.

*Morgan Richardson Goddard Prize*—A memorial established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Washington, D.C. Awarded to the junior or senior student making the highest average in the following fields: business administration, economics, international business, or public accounting.

*Harmon Choral Prize*—Awarded annually for significant musical accomplishment and outstanding contribution to the choral program.

*Ching-Yao Hsieh Prize*—Two prizes awarded annually, one to an undergraduate and one to a graduate student in the Department of Economics.

*Gardiner G. Hubbard Memorial Prize in United States History*—Established by Gertrude M. Hubbard in memory of her husband and awarded annually to that member of the graduating class majoring in history who has maintained the highest standing in courses in United States history.

*Human Services Program Prize*—Awarded by the Department of Human Services to a graduating senior who best exemplifies the attributes of service to the profession and academic achievement while a student at the University.

*Cecille R. Hunt Prize*—Offered annually to deserving art students and every two or three years to participants in the University's Art Alumni Exhibition.

*International Business Prize*—Two prizes awarded annually by the School of Government and Business Administration to students specializing in international business, one awarded to a graduating senior and one awarded to a graduate student.

*Elmer Louis Kayser Prize*—Established by Paul and Elizabeth Rutheiser to be awarded annually by the Department of History for the best thesis in history submitted by a candidate for the degree of Master of Arts.



*David Lloyd Kreeger Prizes in Art*—Eight prizes given by Mr. Kreeger, six in the fine arts and two in art history (including museology). Fine arts prizes are awarded to a senior or graduate student in painting, sculpture, printmaking, ceramics, photography, and visual communication. One prize in art history is awarded to a senior and one to a graduate student. Candidates for the prizes must submit original papers or works of art. Winners are selected by distinguished representatives of the field of art in the Washington, D.C., area.

*Minna Mirin Kullback Memorial Prize*—Established in 1968 by Solomon Kullback in memory of his wife. Awarded annually by a committee of faculty members of the Department of Statistics to a full-time undergraduate or graduate student majoring in statistics, who will have completed 18 semester hours of statistics courses by the end of the spring semester.

*John Francis Latimer Prize in Classics*—Established in 1973. Awarded to a graduating senior who has made the most outstanding record as a major in the Department of Classics.

*Hilda Haves Manchester Prize in Sociology*—Established in honor of Hilda Haves Manchester, B.A. 1932, an outstanding student whose major field was sociology. Awarded annually by Columbian College of Arts and Sciences to the senior student majoring in sociology who has the highest scholastic record.

*The Barry Manilow Endowed Prize in Music*—Established in 1983. Awarded annually to a student majoring in music. The award is made on the basis of academic performance and musical ability, as determined by a committee of faculty appointed by the chair of the Music Department.

*Vivian Nellis Memorial Prize*—Awarded to a student in the English Department who has shown special promise in the field of creative writing.

*Phi Delta Kappa Prize*—Awarded annually by the George Washington University Chapter to an outstanding senior in a teacher education program in the School of Education and Human Development.

*Phi Delta Kappa Research Prize*—Awarded annually by the George Washington University Chapter to a graduate student, for an outstanding research project.

*Phi Eta Sigma Prize*—A choice book selected from the field of the recipient's major, awarded annually by the George Washington University Chapter to the student attaining the highest scholastic average in the first full semester of work. The winner's name is engraved on a plaque in the Office of the Dean of Columbian College of Arts and Sciences.

*Pi Lambda Theta Prize*—Awarded annually by Alpha Theta Chapter to an outstanding senior in a teacher education program in the School of Education and Human Development.

*Psi Chi Prizes*—Two prizes awarded annually by the George Washington University Chapter to the best undergraduate student in experimental psychology and to the M.A. degree candidate or second-year graduate student submitting the best thesis or research project in psychology.

*Public Administration Prize*—Awarded by the Department of Public Administration to the outstanding graduating student in public administration on the basis of scholarship, leadership, and service to the University.

*Riggs Trust Award*—Established by Francis J. Lyons, Vice-Chairman of the Board, Riggs National Bank, for the best graduate research paper in Business Administration 223, Investment Analysis and Portfolio Management.

*Ruggles Prize*—Established by Professor William Ruggles in 1859. Awarded annually to a candidate for a bachelor's degree for excellence in mathematics.

*The Jack and Anne Ryan Award in Health Services Administration*—Awarded annually to that health services administration student who displays excellence



of analysis and writing skills in the preparation of a paper on a topic in health services administration.

*Howard C. Sacks Prize*—Awarded to a student in political science who has demonstrated outstanding academic achievement in the study of Far Eastern affairs.

*Hermann and Johanna Richter Schoenfeld Prize*—Established in grateful appreciation of the inspired teaching and devotion to his students of Dr. Hermann Schoenfeld, who for more than 20 years until his death in 1926 headed the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was widely recognized as a scholar of distinction whose presence on the faculty added prestige to the University. This prize is given annually to a member of the graduating class for excellence in historical and cultural phases of German studies.

*Julian H. Singman Prizes*—Two prizes awarded annually, one in design and one in aquarelle painting.

*Walton E. Smith Memorial Prize*—Awarded annually by the Department of Management Science to a graduating student for outstanding performance in the field of information systems technology. The award is given to a student who has demonstrated exceptional performance on the comprehensive examination, in course work, and in contributions to the program by other means.

*Society of Colonial Wars in the District of Columbia Prize*—A cash prize awarded to a candidate for a graduate degree who, in the judgment of the faculty of the Department of History, submits a thesis or dissertation demonstrating excellence in historical research in American Colonial history. The University reserves the right to withhold the award if no thesis or dissertation attaining the required degree of excellence is submitted.

*Staughton Prize*—Established by the Reverend Romeo Elton and awarded annually to the student making the best record in the most advanced courses in Latin language and literature.

*Alfred E. Steck Memorial Prize*—Awarded for proven excellence in the field of sculpture.

*James MacBride Sterrett, Jr., Prize*—Established in 1911 by Professor Sterrett in memory of his son. Awarded annually to the student who obtains the highest average in Physics 1 and 2.

*Charles Clinton Swisher Historical Club Prize*—Established in 1936 by the Charles Clinton Swisher Historical Club and augmented in 1941 by the bequest of Professor Swisher. Awarded annually to the student who submits the best essay covering some phase of medieval history.

*James H. Taylor Graduate Mathematics Prize*—Established in memory of James H. Taylor, former Professor of Mathematics at the University. Awarded annually to a graduate student for outstanding performance in mathematics.

*Geza Teleki Prize*—Awarded for outstanding work in the geological sciences.

*Patricia M. Toel Memorial Prize*—Awarded annually to a graduate student in photography to recognize outstanding achievement.

*Benjamin D. Van Evera Memorial Prize*—Awarded annually to that Graduate Teaching Fellow in Chemistry selected as the most effective teacher during the current academic year.

*The Wall Street Journal Leadership Prize*—Awarded annually to a graduating senior with a major field of study in finance within the Bachelor of Business Administration degree for outstanding academic performance and service to the University.

*Thomas F. Walsh Prize*—Established in 1901 and awarded annually to the student who submits the best essay in Irish history.



**Elizabeth Reed Ward Award**—Established by the finance faculty of the Business Administration Department in honor and memory of Elizabeth Reed Ward, who was a teaching assistant in finance. The award is to be made to an outstanding teaching assistant in the finance program.

**Alexander Wilbourne Weddell Prize**—Established in 1923 by Virginia Chase Weddell in memory of her husband. Awarded annually to a degree candidate who writes the best essay on "the promotion of peace among the nations of the world." The prize essays shall become the property of the University and shall not be printed or published without the written consent of the University. The University reserves the right to withhold the award if no essay attaining the required degree of excellence is submitted.

**W.T. Woodson Prize**—Awarded annually to a graduate student demonstrating outstanding achievement in educational administration in the School of Education and Human Development.

## REGULATIONS

Students enrolled in the University are required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which registered.

Students who withdraw or are suspended, or who, for any other reason, are not registered at the University for one semester or more, may reenter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has matriculated at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the faculty) for subsequent registration in the University.

## STUDENT STATUS

For the purpose of defining student status, undergraduates taking 12 or more semester hours and graduates taking 9 or more semester hours are considered to be full-time students. All other students are considered to be part time.

## ATTENDANCE

Students may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

## SCHOLARSHIP REQUIREMENTS

Students who fail to maintain the scholarship requirements of the college, school, or division in which registered may be dismissed from the University.



### Grades

Grades are mailed to students through the Office of the Registrar at the close of each semester. They are not given out by instructors or released over the telephone.

#### UNDERGRADUATE

The following grading system is used: A, Excellent; B, Good; C, Satisfactory; D, Low Pass; F, Fail; I, Incomplete; IP, Progress; W, Authorized Withdrawal; Z, Unauthorized Withdrawal; P, Pass; NP, No Pass. Other grades that may be assigned are A-, B+, B-, C+, C-, D+, and D-. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of D or better was received, unless required to do so by the department concerned. A written statement, indicating that the student is required to repeat the course, must be submitted to the student's dean by the appropriate department chairman.

#### GRADUATE

The following grading system is used: A, Excellent; B, Good; C, Minimum Pass; CR, Credit; F, Fail; I, Incomplete; IP, Progress; W, Authorized Withdrawal; Z, Unauthorized Withdrawal. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of C or above was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the student's dean by the appropriate department chairman.

#### INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol I (Incomplete), the symbol W (Authorized Withdrawal), or the symbol Z (Unauthorized Withdrawal) will be recorded. The symbol I indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of I may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded F. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. The grade of Z is assigned when students are registered for a course that they have not attended and in which they have done no substantial graded work.

#### CHANGING A GRADE OF INCOMPLETE

For information concerning changing a grade of Incomplete, consult the regulations of the college, school, or division concerned.

#### THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on his or her record in this University. Quality



points are computed from grades as follows: A, 4.0; A-, 3.7; B+, 3.3; B, 3.0; B-, 2.7; C+, 2.3; C, 2.0; C-, 1.7; D+, 1.3; D, 1.0; D-, .7; F, 0, for each semester hour for which the student has registered in a degree program. Courses marked CR, I, IP, P, NP, W, or Z are not considered in determining the index, except that courses marked I will be considered when a final grade is recorded. With the exception of Consortium courses, grades in courses taken at other institutions are not considered in computing the quality-point index.

### **Final Examinations**

Final examinations for undergraduate courses are scheduled by the Office of the Registrar. Examinations for courses numbered 201 or above are scheduled, if desired, by the individual department or instructor.

### **Academic Dishonesty**

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairs, all academic deans, the Registrar, and the Vice President for Academic Affairs.

### **STUDENT CONDUCT**

All students, upon enrolling and while attending The George Washington University, are subject to the provisions of the *Guide to Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, including the Code of Student Conduct, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the office of Judicial Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

### **WITHDRAWAL**

Withdrawal from a course or from the University requires the permission of the dean of the college, school, or division in which the student is registered. A grade of W will be recorded on the student's academic record. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see Payment of Fees).



Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations. Unauthorized withdrawal will result in the recording of a grade of Z for the course or courses.

### CHANGES IN PROGRAM OF STUDY

*Changes Within a College, School, or Division*—A student may not substitute one course for another, drop courses (see Withdrawal, above), or change status from credit to audit or from audit to credit without the approval of the dean of the college, school, or division in which registered.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Change from one major field to another within the same college or school may be made with the approval of the dean.

*Transfer Within the University*—Application for transfer to another college, school, or division must be made to the appropriate admitting office on the form provided by the office concerned.

With the exception of the School of Government and Business Administration, which limits a student to 15 semester hours earned in nonmatriculated status, maximum of 45 semester hours earned in the Division of Continuing Education may be applied toward a bachelor's degree in the other degree-granting colleges or schools of the University.

Students transferring within the University are advised to study carefully the requirements listed below under Graduation Requirements and to note that, unless otherwise specified, in all undergraduate divisions, 30 semester hours, including at least 12 semester hours in the major field, must be completed while registered in the school or college from which the degree is sought. Upon transfer the student should consult the dean concerned and understand clearly the requirements that must be fulfilled.

### CREDIT

Credit is given only after completion of registration in a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the college, school, or division concerned.

*Auditing*—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. Tuition is charged at the prevailing rate.

### POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of their dean. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

### TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan install-



ments, due the University at the time of the request. A fee of \$2 is charged for each transcript. Partial transcripts are not issued.

### CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below), he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

### LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. The right to use of University facilities is suspended while the leave is in effect.

### INACTIVE STATUS

Under the regulations established by each school and college, a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative engineering work semester; study abroad program; attendance at another institution with prior approval to have work transferred back to the GWU program; completion of outstanding work in courses in which a grade of Incomplete was received; or non-course instructional activities unique to the particular school or college.

Students must request to be enrolled in inactive status, in advance of the year or semester concerned, and be granted approval by their dean for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

### GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended by the faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; filed an application for graduation prior to the published deadline date; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

**Application for Graduation**—An Application for Graduation form must be filed at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) dated September 30, provided they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions.

**Scholarship**—The student must meet the scholarship requirements for the particular degree for which registered.



**Curriculum**—Minimum curriculum requirements for each degree are stated under the college or school offering work in preparation for the degree.

**Residence**—Unless otherwise specified, in all undergraduate divisions of the University, a minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the school or college from which the degree is sought. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean of the college or school concerned to pursue work elsewhere, the work of the senior or final year must be completed in the college or school from which the degree is sought.

The graduate student must meet the residence requirements for the particular degree for which registered.

**Thesis or Dissertation**—A thesis or dissertation submitted in partial fulfillment of requirements for a degree must be presented in its final form to the dean of the college or school concerned no later than the date specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, become the property of the University and are deposited in the University's Gelman Library, where the duplicate copies are bound and made available for circulation. See the appropriate college or school in this *Bulletin* for regulations governing theses and dissertations.

## HONORS

Bachelor's degrees with honors are awarded to students whose academic records give evidence of particular merit. The student's quality-point index determines the level of honors as follows: *cum laude*, 3.4–3.59; *magna cum laude*, 3.6–3.79; *summa cum laude*, 3.8–4.0.

The quality-point index is calculated by the Office of the Registrar, and the honors designation is entered on the transcript and diploma of those students who earn an honors designation. The quality-point index includes all course work completed at GWU and is not rounded off. To be eligible for an honors designation, a student must complete at least 60 hours of course work at GWU.

## SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of the graduating class for outstanding achievement in the student's major field on recommendation of the major department. The student must fulfill all of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.
2. Such other conditions as may be set at the time the candidacy is approved must be met.
3. At least one-half of the courses required for the degree must have been completed at GWU.
4. The specific requirement of the college or school in which the student is registered must be fulfilled as follows: (a) Columbian College of Arts and Sciences or the Elliott School of International Affairs—grades of A or B in 50 percent of the courses taken at GWU; (b) the School of Education and Human Development or the School of Government and Business Administration—a quality-point index of at least 3.0 on all course work taken at GWU.

Special honors awards may not necessarily appear on diplomas.



## THE LIBRARY

All students registered in the University have the privilege of using the University's Gelman Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University's Gelman Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

## RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

## RIGHT TO CHANGE RULES

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

## RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

## UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height, weight, and age of members of athletic teams. A student who does not wish such directory information released must



file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

### PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

### UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

### ASSOCIATIONS AND SERVICES

#### CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

Ten universities in the Washington area—American University, Catholic University of America, Gallaudet University, George Mason University, George Washington University, Georgetown University, Howard University, Marymount University, the University of the District of Columbia, and the University of Maryland—are associated in a Consortium through which they coordinate the use of their respective facilities; Mount Vernon College and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings the particular courses that best meet their needs. This privilege is subject to regulations of the school or division in which the student is enrolled.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, nursing, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (such as music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the program announcements of all participating institutions. See Registration for information concerning registration for Consortium courses.



Registration forms and instructions are available from the registrar of the institution in which the student is enrolled. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

### THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. Special reading improvement classes are conducted for high school and college students as well as other adults. There is also an After-School Program designed for academically gifted children. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

**Fees**—Individuals should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center, Fungler Hall, Suite 429, 2201 G St., N.W.

### THE SPEECH AND HEARING CENTER

Coordinator W.P. Cupples

The George Washington University Speech and Hearing Center provides diagnosis and treatment of a wide range of speech, language, and hearing disorders. These include developmental impairments of articulation and language, stuttering, voice disorders, and speech and language impairments resulting from neurological damage. Evaluation and aural rehabilitation are also provided for hearing-impaired individuals. The Speech and Hearing Center operates in conjunction with the Department of Speech and Hearing.

### THE WRITING CENTER

Director Kim Moreland

The Writing Center, located in Stuart Hall, is a center for informal and personal writing instruction; its services are provided free to all GWU students. Students at all levels of experience and expertise are encouraged to use the Center for help in identifying writing problems and learning how best to express ideas. Trained tutors (undergraduate peer tutors, graduate students, the Director, and other members of the faculty) work with students individually on areas of specific need or interest. Tutors can provide assistance in such areas as organizing a mass of information efficiently and clearly, using correct grammar and punctuation, getting started on a writing project, developing a thesis, providing evidence in support of an argument, and presenting the findings of an experiment or the solution to a research problem.



## UNIVERSITY COMPUTER CENTER

Director F. William Rambo

The University Computer Center, located in the Academic Center, is normally open 24 hours a day, seven days a week, during the academic semesters; the user area may not be open nights during the winter and summer breaks.

The Center provides computational facilities, consultation, and operational assistance as required. It operates two IBM 4381 computers (VM/VS1/CMS). Public terminals and dial-in lines are available for academic users. There is a full range of compilers and application software packages.

In addition to the central facility, computer services and facilities are available in several of the schools; microcomputers are widely available as well. The University's GW Data Network ties together the mainframes and many of the microcomputers, and the University computers are connected to the national computer networks BITNET and SURANET.

## COMPUTER INFORMATION AND RESOURCE CENTER

Director Donald E. Rickert

The Computer Information and Resource Center/User Services (CIRC/US) is the primary source of information and consultation on the use of computers and computer networks at the University. In cooperation with the Gelman Library and GW Television, CIRC/US publishes a periodic newsletter on computing issues, gives seminars, and offers technical advice to faculty and students regarding access to and use of the IBM mainframe and microcomputers, the GW Data Network, and microcomputer selection and acquisition. CIRC/US is responsible for distribution of a number of site-licensed microcomputer software packages and administers and can make recommendations on various discount-purchase programs for microcomputer equipment.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics/Computer and Information Systems, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request; the schedule of charges is available at CIRC/US in the Academic Center.

## GW TELEVISION

Assistant Vice President for Television Ted J. Christensen

The main television resource of the University is GWTV, a state-of-the-art ITFS, multichannel broadcast facility. Goals of GWTV are to develop courses and programs in cooperation with academic departments for broadcast off campus; to develop videotapes for class use and for continuing professional education; to expand a program of national and international teleconferences; and to manage the acquisition and maintenance of television equipment and facilities in various instructional units.

Operating from studios located in the Academic Center, GWTV has the capability to receive from and transmit to any communications satellite. Video teleconference programs are delivered to a number of on-campus locations, such as studios, conference rooms, and auditoriums, where participants can interact by telephone link with the originating site.



## ALUMNI RELATIONS OFFICE

Director Ronald W. Howard

The Alumni Relations Office, in conjunction with the General Alumni Association, makes available to alumni and their families an annual program of services and educational and cultural events. The Office prepares both a Fall and Spring Schedule of Alumni Events, listing all activities; students are invited to participate in the programs held on campus. In addition, the Alumni Relations Office sponsors or cosponsors programs and services designed specifically for the student body.

Alumni are encouraged to inquire about available services and programs at the Alumni Relations Office and to keep the Office informed of any changes in address or occupation.

The Alumni Relations Office is located in Alumni House, 714 21st St., N.W.

## GENERAL ALUMNI ASSOCIATION

President Edward N. Vest

The objectives of this organization are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University, who has left the University in good standing, and whose class has graduated is eligible for membership; in the case of the Division of Continuing Education students, however, only the "15 credit hours earned" requirement and not the "graduation of the class" requirement applies. Graduates of CCEW certificate programs are also eligible.

A Governing Board, composed of members representing the constituent alumni of the University's schools and college, directs the activities of the Association. The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

## ROTC

George Washington University students may enroll through the Consortium in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Limited credit for such courses (primarily advanced ROTC) may be assigned for electives to meet degree requirements at George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

See Naval Science under Courses of Instruction for the NROTC program at George Washington University.



## STUDENT LIFE

*Vice President for Student and Academic Support Services Robert A. Chernak*

The Office of the Vice President for Student and Academic Support Services establishes policy and procedures for those departments that affect student life, including Lisner Auditorium and the offices of Admissions, Student Financial Aid, Campus Life, Safety and Security, Athletics and Recreation, and the Dean of Students (which includes Housing and Residence Life, the Student Health Service, the Counseling Center, the Career Services Center, International Student Services, Disabled Student Services, and the Educational Opportunity Program).

### OFFICE OF THE DEAN OF STUDENTS

*Assistant Vice President and Dean of Students Gail Short Hanson*

*Assistant Dean of Students Cheryl Beil*

*Assistant Dean, Educational Services Linda Donnels*

The Office of the Dean of Students provides counseling and information for students, administers the nonacademic student disciplinary system, and assists in nonacademic program development. Staff members are well informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students is responsible for the services and programs indicated below; the office is located on the fourth floor of Rice Hall.

### Housing and Residence Life

*Director Ann Webster*

*Associate Directors David McElveen, Barbara McGraw*

*Assistant Directors Rebecca Griffin, Mark Crowley*

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052.

Admission to the University does not include a room reservation. The student will receive, with the notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a \$300 nonrefundable deposit. The housing deposit is credited toward the first semester's room or apartment charge.

Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester, unless the student elects the deferred payment plan or the 10-month payment plan. Please check with Housing and Residence Life for the deferred payment plan and with Student Accounts for the 10-month payment plan.

Residence hall space and apartment accommodations are not generally available to graduate students.



## 1989-90 RESIDENCE HALL RATES PER PERSON FOR TWO SEMESTERS\*

Adams Hall	
double room.....	\$3,320
triple room.....	3,190
Crawford Hall	
double room.....	3,320
Everglades Hall	
triple room.....	3,320
Guthridge Hall	
apartment for one person.....	3,840 or 3,900
apartment for two persons.....	3,790
apartment for three persons.....	3,460
Building JJ	
apartment for two persons.....	3,650
apartment for four persons.....	3,270 or 3,650
Francis Scott Key Hall	
apartment for one person.....	3,900
apartment for two or three persons.....	3,790
Madison Hall	
double room.....	3,320
triple room.....	3,190
Milton Hall†	
apartment for two persons.....	3,650
apartment for three persons.....	3,460
Mitchell Hall	
single room.....	3,560
Munson Hall†	
apartment for two persons.....	3,650
apartment for three persons.....	3,460
Riverside Towers Hall‡	
apartment for one person.....	3,910 or 3,980
apartment for two persons.....	3,820
Strong Hall (for women only)	
single room.....	3,560
double room.....	3,320
triple room.....	3,190
Thurston Hall	
double room, triple room, room for four or five.....	3,320

## FOOD SERVICES

Resident freshmen and sophomores are required to choose one of the following food service plans: the any 14 meals per week plan for \$2,300 for the academic year; the any 10 meals per week plan at \$2,240 for the academic year; or the any 7 meals per week plan at \$2,170. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to the dining room in Thurston Hall and to the second-floor contract dining room in the Cloyd Heck Marvin Center. A small percentage of the meal card may also be used on a cash basis in the Marvin Center first-floor cafeteria, George's, and the Courtyard Cafe at Mitchell Hall.

\* Residence hall prices and allocation are subject to change.

† Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate.

‡ Rates include surcharge for HBO.

§ Food service prices are subject to change.



Students who observe the Jewish dietary laws can write to make arrangements with the GW Housing and Residence Life Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

### **Student Health Service**

Director Isabel Kuperschmit, M.D.  
Coordinator Janet Garber, N.P.

The Student Health Service is an outpatient clinic located in the Burns building extension.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits may be arranged by appointment or, during certain hours, secured on a walk-in basis. Many routine lab tests may be performed in the Health Service lab at cost; allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

### **HEALTH AND ACCIDENT INSURANCE**

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should contact the Student Health Service or Office of the Dean of Students.

### **Counseling Center**

Director Diane M. DePalma

The Counseling Center fosters personal growth and development and helps individuals with personal, social, career, and study problems that interfere with their educational goals. University students, staff, and faculty are eligible for services. These include (1) short-term individual counseling, art therapy, crisis intervention, and referral services for personal problems (e.g., academic pressures, relationship issues, family problems, concerns about sex, self-esteem); (2) group counseling for personal problems; (3) educational/vocational counseling and assessment to assist students in planning their majors and careers; (4) workshops designed to facilitate students' learning about themselves and developing new ways of interacting with others (e.g., assertiveness training, stress management, relationship skills, and study skills seminars); (5) consultation with faculty, staff, and student groups about their special needs in designing programs to improve the campus environment.

The Center administers the Miller Analogies Test, GWU admissions tests, and special assessments for business and industry. Its Community Vocational Counseling Services provides career counseling and testing to GWU alumni and the greater Washington community.



Students, staff, and faculty may schedule a cost-free initial interview from 9 a.m. to 5 p.m., Monday through Thursday, and from 1 to 5 p.m. on Fridays. For most services a modest fee per appointment is charged. An additional materials fee is charged for test batteries. Fee adjustments can be made if financial need is a factor. Disabled students are asked to call ahead so that arrangements can be made to adapt services or to meet at an accessible site. The Counseling Center is located at 718 21st St., N.W.

### **Career Services Center**

Director Kathy Sims

Assistant Directors Marva Gumbs, Lucy Hoffman

The Career Services Center provides career planning and job-seeking assistance to students and alumni. Programs and services include full-time and part-time job vacancy listings; career counseling; workshops (e.g., organizing job searches, resume and letter writing, effective interviewing, negotiating for salary); a resource library of career field and employer literature; on-campus interviews for students within one year of graduation; a resume referral service; resume critiques; a call-in job listings service, Jobline; and a credentials service that supports employment and graduate/professional school applications. The Center is located in the Academic Center, Suite T-509.

### **International Student Services**

Director E. Donald Driver

Assistant Director John Hartt

Advisor Ann Morton

International students, scholars, faculty, and staff are provided assistance through International Student Services. The staff offers immigration assistance and information on government requirements and regulations specific to the international community; orientation programs to help with adjustment to living and studying in the United States; and advising and counseling for a variety of personal problems, including cultural adjustment, living conditions, budgets, academic concerns, and financial aid. International Student Services is located at 2129 G St., N.W.

### **Disabled Student Services**

Assistant Dean, Educational Services Linda Donnels

Coordinator Christy Willis

The Disabled Student Services office works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources. The office is located on the fourth floor of Rice Hall.

### **Educational Opportunity Program**

Director Valerie L. Epps

Assistant Director Donald L. Ross

The Educational Opportunity Program (EOP) provides selected District of Columbia students with financial aid, academic support services, and personal advising to assist them in pursuing undergraduate work at George Washington



University. The EOP staff coordinates a precollege program as well as educational and cultural activities to promote the success and enhance the experience of program participants.

The EOP staff administers the High School/College Internship Program (HI/SCIP), which enrolls highly motivated District of Columbia high school seniors. Participants enroll at GWU as nondegree candidates, taking a maximum of 6 credit hours per semester in addition to their high school curriculum. Application to the HI/SCIP program is made through the student's high school guidance office. Counseling and advising is provided by the EOP staff. HI/SCIP students have access to all of the academic support services available to EOP participants. The Educational Opportunity Program is located at 2127 G St., N.W., Room 101.

### OFFICE OF CAMPUS LIFE

Director LeNorman J. Strong

Assistant Directors Donald Cotter, Michael Elmore, Johnnie Osborne, Liz Panyor

The Office of Campus Life furthers the educational mission of the University by offering programs, services, and facilities that provide students with opportunities for personal, professional, social, and cultural development. The Office of Campus Life includes the Campus Activities Office, Cloyd Heck Marvin Center, and New Student Programs and Services. Staff members assist individual students, campus organizations, and the University community with event planning, program coordination, and participation in special projects, both on and off campus. The staff can also help in interpreting University policies and procedures that affect campus activities. The office is located on the second floor of the Marvin Center.

Additional information about the numerous services offered by the Office of Campus Life, and about the various student organizations and committees, can be obtained from the *Student Handbook*.

### Campus Activities Office

The Campus Activities Office provides administrative support to the University Program Board and other groups planning major events. Other services include advisement of campus organizations (including fraternities and sororities), registration of student organizations, leadership training, and planning and coordination of major campus events.

### PROGRAM BOARD

The Program Board, composed chiefly of elected and appointed students, has the primary responsibility of allocating resources for student programming on campus. In addition, the Program Board provides funding for activities presented by various campus organizations and encourages student participation in program planning through involvement in committees on the arts, concerts, festivals, films, parties, political affairs, and public relations. Further information can be obtained from the Program Board office in the Marvin Center.

### STUDENT GOVERNMENT

The George Washington University Student Association is comprised of all full-time and part-time undergraduate and graduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The



Student Association provides various services for students, such as academic evaluations, test and syllabus files, and the Student Advocate Service. Further information can be obtained from the Student Association office in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies, such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and to the University community as a whole.

#### STUDENT ORGANIZATIONS

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 200 registered organizations on campus, covering a broad spectrum of interests, including academic, professional, international, cultural, political, service, sports, hobbies, recreational, religious, and meditative groups as well as social fraternities and sororities. Academic honor societies include Phi Beta Kappa, Sigma Xi, and others related to specific academic disciplines.

#### The Cloyd Heck Marvin Center

The Marvin Center is the campus community center, serving as the "living room" for the George Washington University community. The Marvin Center offers programs, services, and facilities for students, faculty, staff, alumni, and University guests. The Center's wide range of facilities include five dining locations, lounges, recreational facilities, a theatre, study rooms, conference and meeting rooms, major function/event rooms, the Off-Campus Housing Resource Center, the Information Center, a newsstand, a TV lounge, offices for over 40 campus organizations, and a typing/microcomputer center. The Marvin Center provides facilities for programs conducted by the University Program Board, by the academic departments that include the performing arts, and by other University organizations.

The Marvin Center Governing Board, which oversees the Center's policies, is a representative body composed of students, faculty, staff, and alumni. The Board works closely with the Center's staff in the review and development of policies, guidelines, and procedures that direct the operation of the Center.

#### New Student Programs and Services

New Student Programs and Services is responsible for developing and coordinating orientation programs. Staff members advise the Student Orientation Staff and work with University departments and groups in planning orientation programs and services for undergraduate and graduate students.

#### RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the religious organizations of their own choice. Several religious bodies sponsor various groups and form a link between the University and the religious community. The advisors of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.



### MAJOR PROGRAM EVENTS

**Art Exhibits**—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and the art gallery of the Marvin Center. Student art exhibits are presented each semester.

**Concert Series**—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year. Other concerts are held regularly in the Marvin Center, Lisner Auditorium, and the Smith Center.

**Dance**—The GWU Dance Company presents major concerts, informal student performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

**Glee Club, Jazz Band, and Orchestra**—The University Glee Club, Jazz Band, and Orchestra are available to students either as credit courses or as cocurricular activities. All of these organizations present major performances to the University community several times a year, including regular winter and spring concerts.

**International Programs**—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

**Program Board**—The University Program Board, through its various committees and in cooperation with other campus groups, regularly sponsors film lectures, concerts, social activities, and special events.

**Theater**—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students can participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

### DEPARTMENT OF ATHLETICS AND RECREATION

Director Steve Bilsky

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight room; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the Department of Athletics and Recreation offers a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association and the Atlantic Ten Conference. Its women's and men's intercollegiate varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, cross-country, swimming and diving, water polo, badminton, volleyball, and gymnastics.



## SECONDARY FIELDS OF STUDY

A program of secondary fields of study has been established within the University to provide opportunities for formal interschool study. Students must be enrolled in a degree program and must be in good academic standing to be eligible to take a secondary field in another school. The secondary fields consist of 12 to 18 hours of prescribed courses, depending on the field, with scholarship requirements determined by the school offering the field. Upon satisfactory completion of all requirements, the title of the secondary field of study and the courses taken in support of the field are entered on the student's transcript. For further information, see the brochure *Secondary Fields of Study* available in the offices of the deans or from the Vice President for Academic Affairs.

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Acting Dean R.W. Kenny  
Associate Deans D. McAleavey, N.K. Khatcheressian (Acting)  
Director of Academic Advising B.P. Selinsky

### ACULTY 1988-89

Professors E. Abravanel, J. Aschheim, D.L. Atkins, I. Azar, R.P. Bain (Research), W.H. Becker, O. Bergmann, B.L. Berman, B.L. Boulier, L.S. Bowling, T.J. Brennan, A.S. Brooks, R.G. Brown, J.F. Burks, E.A. Caress, A.J. Caron (Research), R. Caron (Research), W.J. Chambliss, A.E. Claeysens, A.G. Coates, J.J. Cordes, T.F. Courtless, Jr., L.G. DePauw, R.M. Dunn, Jr., M.A. East, N. Filipescu, R.S. French, J.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, H.F. Gillette, R.S. Goldfarb, M. Gordon, W.B. Griffith, S.E. Haber, O. Havrylyshyn, G.R. Herer, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, A.J. Hildebeitel, H.C. Hinton, H.H. Hobbs, M.A. Holman, R.L. Humphrey, Jr., R.G. Jones, H.D. Junghenn, I. Katz, R.E. Kennedy, Jr., R.W. Kenny, H. Kenyon, Y. Kim, J.C. King, M. King, A.D. Kirsch, P.F. Klarén, R.M. Krulfeld, J.E. Kwoka, J.M. Lachin III, J.L. Lake, C.J. Lange, P. Langton, H.L. LeBlanc, D.R. Lehman, P.H.M. Lengermann, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lilliefors, C.A. Linden, R.C. Lindholm, C.W. Linebaugh, T.P.G. Liverman, J.M. Logsdon, W.F.E. Long, J.C. Lowe, J.H. Maddox, C. McClintock, M.L. Meltzer, B.M. Mergen, J.C. Miller, C.C. Mondale, J.A. Morgan, Jr., J.N. Mosé, C.A. Moser, N.N. Natov, H.R. Nau, B. Nimer, R.K. Packer, R. Parris, G. Paster, J. Pelzman, T.P. Perros, R.A. Peterson, J.A.A. Plotz, F. Prats, J.A. Quitslund, D.E. Ramaker, B. Reich, W.M. Reynolds, L.P. Ribuffo, C.E. Rice, P. Robbins, L.F. Robinson, L.A. Rothblat, D.A. Rowley, H.M. Sachar, B.M. Sapin, R.M. Scheffler, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schworer, C. Shih, F.R. Siegel, D.E. Silber, N.D. Singpurwalla, A.H. Smith, R.T. Smythe, H. Solomon, C. Steiner, C.W. Sten, G.C. Stephens, R.W. Stephens, C.H. Sterling, C.T. Stewart, Jr., D.H. Teller, K. Thoenelt, R. Thornton, R.P. Trost, D.E. Vermeer, J.M. Vlach, R.D. Walk, R.H. Walker, Jr., D.D. Wallace, Jr., R.A. Wallace, S.J. Wayne, H. Weingartner, D.G. White, M. Withers, J.F. Wright, Jr., H.E. Yeide, Jr., A.M. Yezer, J.E. Ziolkowski, A.J. Zuchelli



Associate Professors C.J. Allen, A. Altman, J.C. Anderson, A.D. Andrews, M. Atkin, S.R. Barnett, E. Berkowitz, G.R. Bozzini, M.D. Bradley, L. Brandt, T. Brennan, M.D.M. Brewer, W.J. Briscoe, K.M. Brown, J.R. Burns, G. Carter, Chaves, R.P. Churchill, M.A.B. Coffland, R.L. Combs, C.C. Costigan, C.J. Deering, R.P. Donaldson, C.F. Elliott, H.B. Feigenbaum, E.A. Fisher, R.S. Fortna, N.C. Garner, H.I. Gates, Jr., I.I. Glick, R.J. Guenther, M.M. Gupta, R.A. Hadley, E.P. Harper, S. Hashtroudi, J.R. Henig, C.J. Herber, D.M. Hitchcock, R.J. Holmstrom, J.O. Horton, T.L. Hufford, L.B. Jacobson, D.E. Johnson, N.D. Johnson, W.R. Johnson, C.C. Joyner, S.A. Karp, N.K. Khatcheressian, Y.K. Kirsh, Renaud, R.E. Knowlton, M.P. Lader, J.H. Lebovic, D.L. Lee, M.P. Lee, D. Lipscomb, R.W. Longstreth, G. Ludlow, D. McAleavey, H. Merchant, J. Miller, S.B. Molina, A. Montaser, J.D. Moreno, L.R. Offermann, Y. Olkhovskiy, T. Ozdogan, W.C. Parke, J.R. Peverley, P.J. Poppen, C.W. Puffenbarger, J. Regnell, R.C. Rutledge, R. Rycroft, P.G. Sáenz, S.E.F. Schlesselman (Research), O.A. Seavey, S.L. Simons, S.C. Smith, M.J. Sodaro, J.L. Stephanic, E.A. Stoner, M.F. Taragin, P.F. Thall, J.M. Thibault, J.E. Thiel, R.E. Thomas, I. Thompson, N.A. Tilkens, J.L. Tropea, S.A. Tuch, B. von Barghahn, A.G. Wade, H.S. Watson, R.C. Willson, S.L. Wolchik, W.T. Woodward, R.Y. Yin

Assistant Professors H.L. Agnew, A.A. Alani (Research), F.E. Baginski, F. Belgrave, M.A. Bobrik, N.J. Brown, J. Butler, Y. Captain-Hidalgo, D.A. Caro, Coleman, A.B. Covarrubias, K.S. Dhuga, D.P. Di Lella, J.K. Donaldson, Jr., M. Dow, D.A. Durham, E.W. Echeverria, R.G. Epstein, V. Fon, D.A. Grier, Griffith, C.F. Gudenius, H. Haberzettl, V. Harizanov, K.J. Hartswick, K. Hockett, G.P. Huvé, M.L. Jasnoski, F.L. Joutz, K. Kappagantula, J.W. Keating, M. Keeler, S. Keller, M.R. Kirkland, S.G. Larson, M.W. Lewis, M.B. Loew, H.M. Mahmoud, C.F. Meloni, M.F. Miller, M.O. Moore, K. Moreland, D. Morris, S.L. Murray, T.K. Nayak, L.E. Osterman, P.M. Palmer, R.F. Phillips, C. Pickar, J.L. Porter, W.A. Pucilowsky, J.A. Quiroga, S.A. Quitslund, F.C. Reiter, R.M. Robin, J.P. Rogers, C.A. Rohrbeck, A. Romines, B.W. Sabelli, R. Simion, Soltan, C.B. Sponsler, R.P. Stoker, R.B. Stott, S.M. Suranovic, S.E. Thompson, M.A. Ticktin, R.P. Tollo, M.A. Tolstedt, B. Toman, D.H. Ullman, R. Valero, Viterito, H.B. Wagner, G.C.Y. Wang, R. Weitzer, E.F. Wells, S.L. Wiley, E. Williams, S.M. Wright, M.-H. Ye

Instructors M.B. Bandas, P. Connerton, P.N. Edmonson, M.E. Evans, C. Iacobelli, T. Kimura, E.M. Murray, M.A.P. Saunders, N. Taghavi

#### Committees\*

##### DEAN'S COUNCIL

1989: S.R. Barnett, L.S. Bowling, T.L. Hufford  
 1990: V. Fon, J.R. Peverley, J.L. Stephanic  
 1991: C. Allen, I. Katz, R.M. Robin

##### CURRICULUM COMMITTEE

1989: C.J. Herber, J.B. Levy, G.K. Paster  
 1990: H.F. Gillette, R.S. Goldfarb, H.W. Lilliefors  
 1991: N.C. Garner, J.A. Plotz, A. Yezer

\* The Dean of Columbian College is an *ex officio* member of all committees; all listed committee members are elected by the Faculty of Columbian College.



## FACULTY PERSONNEL COMMITTEE

- 1989: F. Siegel, C.T. Stewart, D.D. Wallace  
1990: F. Prats, B. Reich, A.H. Smith  
1991: L.S. Bowling, J.F. Burks, J.H. Miller

## COMMITTEE ON ADMISSION AND ADVANCED STANDING

- 1989: M.V. Dow, R.A. Hadley, G.C. Stephens  
1990: M.D. Brewer, N.C. Garner, G. Ludlow  
1991: D.L. Atkins, I. Azar, C.E. Rice

## COMMITTEE ON SCHOLARSHIP

- 1989: J. Aschheim, J.L. Gastwirth, J.H. Maddox,  
H.C. Merchant, C.C. Mondale, R.W. Stephens  
1990: H.B. Feigenbaum, E.A. Stone, J.E. Ziolkowski  
1991: J. Chaves, M. Gupta, R.E. Kennedy

## INTRODUCTION

Since its founding in 1821, Columbian College, the college of liberal arts and sciences of George Washington University, has been the cornerstone of a dynamic campus community in the heart of the nation's capital. With fine facilities and a full-time faculty of about 300, the College offers its 3,500 students the advantages of a small liberal arts institution as well as opportunities for professional and pre-professional education in many fields and for internships and employment in a stimulating urban environment. The College's students come from all 50 states and from about 100 foreign countries.

The rich and diverse liberal arts and sciences curriculum is designed to strengthen the student's ability to communicate, to reason, and to understand the social and physical environment. This purpose is accomplished through the study of various disciplines—the humanities, the social sciences, and the mathematical and natural sciences. With this foundation, Columbian College graduates are well prepared for a wide range of jobs or for more specialized professional and graduate education. The College offers programs leading to the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Music. Students may elect one of more than 50 departmental majors, or they may elect double majors, interdisciplinary majors, or individualized degree programs. Special curricular guidance is given to students planning to apply to a medical or law school.

## ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units,\* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra. Typically, at least a B average or equivalent is required.

\* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.



2. The principal's statement that the applicant is prepared to undertake college work.

3. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on either the Scholastic Aptitude Test or the American College Testing battery.

4. Admission to the Bachelor of Music curriculum requires, in addition to the above, a performance audition (a tape is acceptable) and/or music testing.

It is recommended that the College Board examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, N.J. 08541-6200, not less than one month before the date of the tests. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The Committee on Admission and Advanced Standing will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated here. The Committee may prescribe appropriate scholastic aptitude tests. Students admitted with deficiencies in secondary school units will be required to begin removing such deficiencies within the first year, by appropriate courses or examinations.

#### ADMISSION WITH ADVANCED STANDING

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University are as follows.

Applicants who have accumulated at least 30 semester hours (or the equivalent) of academic credit at another regionally accredited college or university may be admitted to Columbian College as transfer students with advanced standing. Those who have achieved a quality-point index of at least 2.50 on a 4.0 scale in previous college work will be given preference for admission. Applicants who have completed fewer than 30 semester hours of acceptable credit must meet the entrance requirements for freshmen.

Advanced standing may be awarded for properly certified courses for which the student received a grade of C or above, provided that such courses are comparable to the curriculum requirements for the degree sought in Columbian College. No more than 9 semester hours of professional (engineering, education, business) courses completed at another institution will be assigned toward a degree in Columbian College. In the case of course work completed at a two-year college, no more than 66 semester hours of credit may be applied as advanced standing toward a degree in Columbian College.

Although a grade of D in a course is not acceptable for transfer, the course may satisfy a curriculum requirement. Credits earned with a grade of D will not, however, be assigned as advanced standing.

Columbian College reserves the right to refuse credit for transfer in whole or in part or to accept credit provisionally.

It is the responsibility of the student to have an official transcript from each institution formerly attended sent directly to the Office of Admissions, George Washington University, Washington, D.C. 20052.



Students wishing to transfer from another division of the University into a degree program in Columbian College must submit to the Office of Admissions a formal application for transfer and must be in good academic standing with a cumulative quality-point index of 2.0 or above at the time of transfer. A maximum of 45 semester hours earned as a nondegree student in the Division of Continuing Education may be applied toward a degree in Columbian College.

All transfer students must satisfy the residence and course requirements for degrees awarded by Columbian College.

## REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulations.

## ADVISORY SYSTEM

Each student is provided with both academic advising and personal counseling. Academic advising is performed by members of the faculty selected for their knowledge of academic programs, and each student, before registration, makes up a program in consultation with the advisor assigned. A student who has not selected a major field receives academic advising in the office of the dean, Columbian College Student Services. Students must keep in close touch with their advisors, whose office hours are posted in the Student Services reception area. A student who has officially declared a major field receives academic advising from the appropriate department or from an interdepartmental committee. Personal counseling is available through the office of the Dean of Students or through the University Counseling Center.

An academic warning system directs early attention to students whose work falls below required standards. In such cases, students are asked to consult regularly with their advisors. On request, and with the student's permission, copies of academic warnings or probation notices may be sent to parents or guardians, who are themselves welcome to meet with members of the advisory staff.

### Peer Advising

To supplement academic advising by faculty members in Columbian College, peer advising is also available during fall and spring registration and the Summer Advance Registration Program. Undergraduate peer advisors, representing a broad range of major fields, are centrally located to offer scheduling help and course selection advice to fellow students. Peer advisors are available to provide assistance throughout the academic year. A directory of peer advisors is available from the office of the dean shortly after the beginning of each semester.

## SCHOLARSHIP REQUIREMENTS

### Academic Work Load

To encourage academic performance of high quality, the College limits the student's work load.

A full-time student not on probation may take a course load of as much as 17 semester hours.

The amount of work taken by a student on probation will be limited by the Committee on Scholarship.

A full-time student who, during the immediately preceding semester, has received no grades below B- and has earned grades of A or A- in three courses totaling at least 9 semester hours may take 18 or 19 hours.



A student who accepts employment after registration or at any time during a semester must immediately report that fact to the dean so that the academic program may be adjusted, if necessary.

#### Attendance

The student is held responsible for all the work of the course in which registered and all absences must be excused by the instructor in charge before provision is made for the student to make up work missed.

#### Classification of Students

A student becomes a *sophomore* upon completion of 30 semester hours, a *junior* upon completion of 60 semester hours, and a *senior* upon completion of 90 semester hours.

An *unclassified* student is one who is not a candidate for a bachelor's degree (normally because the student already holds one) but who wishes for valid academic reason to take a limited program for a limited time. Registration in this status is permitted only with the prior approval of the Dean's Council.

#### Leave of Absence and Continuous Enrollment

Students in Columbian College who wish to interrupt their studies must apply to the dean for either Continuous Enrollment or Leave of Absence (see Regulation on page 49). If approved, either form of inactive status assures the student that, for at least one semester, re-entrance to the College may take place under regulations prevailing at the time of last registration. A student may re-apply for a second semester of either type of leave, but ordinarily such leave is only available for one calendar year. After two semesters of inactive status, the student is expected to resume active study toward a degree.

All study toward a degree program at any other college or university, in this country or abroad, undertaken by a continuing student must be approved by the dean in advance.

#### Academic Standing

A student who is not suspended or on probation is considered to be in good standing.

The following rules governing probation and suspension are applicable to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester. Students enrolled for less than 12 semester hours during the fall or spring semester and students enrolled during the summer sessions are subject to probation or suspension on the basis of their cumulative record, a "semester" being considered a time interval in which at least 12 semester hours have accrued.

**Probation**—A student whose cumulative quality-point index is less than 2.00 (but 1.00 or more) after attempting a minimum of 24 semester hours will be placed on probation. The course load of a student on probation shall be no more than 13 semester hours. Probation will be removed if, after a first or second semester on probation, the student's quality-point index is raised to 2.00 or more. A student still on probation after two semesters (or 24 semester hours attempted) ordinarily will be suspended but may be continued on probation by the Committee on Scholarship (see below).

**Suspension**—The following circumstances constitute grounds for suspension: (1) a cumulative quality-point index below 1.00 after attempting a minimum of



24 semester hours, and (2) failure to attain a cumulative quality-point index of 2.00 or more after two successive semesters (or 24 semester hours attempted) on probation. The Committee on Scholarship may continue a student on probation (in lieu of suspension) if satisfactory progress is demonstrated during the probationary period and/or sufficient evidence of academic promise, by way of a statement of appeal, is offered by the student.

The minimum period of academic suspension is one fall or one spring semester. Final dates for applying for readmission are the same as those governing undergraduate admission (see Admissions). A suspended student seeking readmission must submit evidence to the Committee on Scholarship of conduct during absence from the University that indicates that the student will profit from readmission. A student suspended twice for poor scholarship will not be readmitted.

**Semester Warning**—A student whose cumulative quality-point index is less than 2.00 after attempting a minimum of 12 semester hours will be issued a warning notice at the end of the semester by the Office of the Dean and shall be strongly advised to take corrective measures (e.g., limitation of course load to no more than 13 semester hours).

**Mid-semester Warning**—When, at the end of the eighth week of each semester, instructors file in the Office of the Dean the names of freshman and sophomore students who are doing unsatisfactory work, a notice of warning is sent to the student and a copy filed with the appropriate advisor. A warning constitutes notice to the student to consult the instructor and advisor at the earliest opportunity.

### **Adding and Dropping Courses**

After registering, a student may add or drop courses only by means of an official program adjustment form available in the Office of the Dean, Columbian College Student Services. Failure to submit the form when dropping a course may result in a failing grade. The deadline for adding a course during the regular fall or spring semester is the end of the second week of classes.

The deadline for dropping a course without academic penalty is the end of the eighth week of classes in the fall and spring semesters. A course dropped during the first three weeks of classes will not appear on a student's transcript. A course dropped between the fourth and eighth week will be assigned the grade of W (withdrawal without academic penalty); an official withdrawal form must be submitted.

The deadline for complete withdrawal from a student's entire program of courses without academic penalty is the end of the ninth week of classes.

After the deadlines, program changes are not possible unless the student presents a petition to the Dean's Council and receives permission.

### **Incompletes**

Conditions under which the grade of I (Incomplete) may be assigned are described under Regulations.

**Changing an Incomplete**—Incomplete work must be completed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of I is assigned. When work for the course is completed, the grade earned will be indicated in the form of I/ followed by the grade. The indication of I/ cannot be removed from the transcript. A grade of I that is not changed within this period automatically becomes an I/F. In cases of well-documented extenuating circumstances, an



instructor and a student may jointly petition the dean or the appropriate committee for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of I cannot be changed by reregistering for the course here or by taking its equivalent elsewhere.

#### **Dean's List**

The name of any student who takes 15 semester hours or more of graded course work in any one semester and attains a semester quality-point index of 3.60 or more with no grades below B- will be placed on the Dean's List for that semester. A course taken on a Pass/No Pass basis beyond the 15-hour minimum of other courses does not affect the student's eligibility for the Dean's List, nor are the semester hours of such a course computed in the above figures. A grade of No Pass, however, disqualifies the student from the Dean's List.

### **THE ASSOCIATE IN ARTS DEGREE**

The Associate in Arts degree may be granted to a student who has completed 60 semester hours in arts and sciences with acceptable grades and has fulfilled the General Curriculum Requirements, listed below. The last 15 semester hours of the program of study must be completed in residence in Columbian College.

### **THE BACHELOR'S DEGREES**

Columbian College offers programs leading to the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Music.

In cooperation with the School of Medicine and Health Sciences, a seven-year curriculum leading to the combined degrees of Bachelor of Arts and Doctor of Medicine is offered.

For teacher certification for Columbian College students, see the School of Education and Human Development.

#### **The Standard 120-Semester-Hour Program**

One hundred twenty hours of course work must be passed and a quality-point index of at least 2.0 achieved in courses graded on a 4.0 scale. General curriculum, major, and other requirements described below must be met.

Each student must declare a major, usually in the sophomore year. A student may change the major with the consent of the dean and of the department committee concerned; the student must meet the requirements for the new major in effect at the time the change is approved. At least 60 hours of course work must be taken outside the major-field department or major program. (This does not apply to the Bachelor of Arts curriculum in dance nor to the 129-hour Bachelor of Music curriculum.)

See page 46 for an explanation of how the quality-point index is computed. See page 77 for scholarship requirements applicable specifically to departmental majors.

All students, including those transferring from other institutions or from another school or division of this University, with major requirements wholly or substantially met, must satisfy the residence requirement of Columbian College stated below.



### The 90-Semester-Hour Program

The 90-semester-hour degree program is designed for the exceptionally able student. This program, which leads to the regular Columbian College degrees, makes it possible to graduate in three normal academic years with a total of 90 semester hours of credit instead of the standard 120. Students in this program must complete all of the requirements for the three-year degree in the semester in which the 90th semester hour is achieved.

The requirements for this program are (1) 90 semester hours of credit earned in college courses (that is, the 90-hour requirement may not be reduced by credit earned through examinations); (2) completion of the chosen major-field program and general curricular requirements; (3) grades of A or A- in at least 45 semester hours of course work and no grades below C-; (4) at least 60 semester hours of credit earned in 100-level courses; and (5) recommendation of the major department or program.

To be eligible for this program, the student must show evidence of exceptional academic ability by college record, performance in college courses, and other appropriate information.

An interested student should make application directly to the major-field departmental chairman or program director as soon as possible, preferably by the end of the first year of study. The student's academic record to that point will, of course, provide a useful criterion of eligibility.

A transfer student may qualify for graduation under the 90-hour program if he or she completes at least 60 semester hours of the approved 90-hour program in Columbian College, earns grades of A or A- in no less than 45 semester hours of such course work at this University, and has no grades below C-.

A student who fails to maintain the required academic performance while studying toward the 90-hour degree program simply continues for the standard 120-hour degree.

### Residence

*For the Standard 120-Semester-Hour Program*—A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed in residence in Columbian College. *Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior year must be completed in residence.* This requirement applies to students transferring within the University, to students transferring from other institutions, and to students in programs leading to the Bachelor of Music and Bachelor of Arts in the field of dance.

*For the 90-Semester-Hour Program*—The last 60 semester hours, including at least 12 hours in the major field, must be completed in residence in Columbian College.

*Summer Work*—Summer work in residence may be counted toward all Columbian College degrees.

### Study Abroad Programs

Study abroad programs for the academic year are currently available in England, France, Germany, Japan, China, and Peru. Students who wish to study in countries not mentioned here should check with the office of the dean. Credits earned with acceptable grades are transferable toward the appropriate degree at George Washington University, provided there is no duplication of work done previously. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. Information may be obtained from the Study Abroad Office, Stuart Hall, Room 102.



Study abroad is available at varying locations during the summer. Information on summer programs abroad is available in the GWU Summer Sessions Announcement and through the Division of Continuing Education.

### **Combined Degrees of Bachelor of Arts and Doctor of Medicine**

A candidate for the combined degrees of Bachelor of Arts and Doctor of Medicine must (1) complete the entrance requirements for the Doctor of Medicine degree at the George Washington University School of Medicine and Health Sciences; (2) complete the general Columbian College course requirements; (3) earn 90 semester hours in the liberal arts, including a minimum of 30 in second-group courses in Columbian College; (4) obtain the approval of the Dean of Columbian College at the time of entering the School of Medicine and Health Sciences; (5) obtain the recommendation of the Dean for Academic Affairs of the Medical Center at the completion of all prescribed courses in the first year of the Doctor of Medicine program, at which time the degree of Bachelor of Arts will be conferred (professional credit courses taken at another institution do not count toward the combined degrees); (6) maintain throughout the entire course the scholarship level required for graduation.

### **Second Bachelor's Degree**

Columbian College graduates who wish to receive a second bachelor's degree must satisfy the general College requirements, the requirements of their new major and degree, and the 30-hour residence requirement. Students with undergraduate degrees from other institutions or from other divisions of the University, if admitted to the College, must meet the same set of requirements.

## **PLACEMENT, WAIVER, AND CREDIT EXAMINATIONS**

### **Preliminary Placement Examinations**

Many departments in Columbian College, including English, mathematics, and all foreign languages, require students to take placement tests to determine level of proficiency or eligibility for specified courses. The student is placed in the appropriate course on the basis of these tests. There is no charge to the student for placement tests, and no credit (advanced standing) is awarded for courses bypassed or waived as a result of these tests.

**English**—Students whose scores on either the Test of Standard Written English or on the English Composition Achievement Test suggest that they will benefit from more intensive training in compositional skills may be assigned to Engl 9. Engl 9 may be tested in vocabulary, spelling, grammar, standard usage, and writing skills before placement in either Engl 9 or 10. Students whose scores indicate superior competence will be allowed to waive the Engl 10 requirement.

**English for International Students**—see page 25.

**Foreign Languages**—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Japanese, Korean, Latin, Portuguese, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

**Mathematics**—New students who wish to register in Math 30, 31, or 41 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 are required, prior to registration, to take a placement examination in algebra.



### Earning Credit by Examination

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned for any combination of the following:

**College Board Advanced Placement Tests**—See Admissions. Credit may be granted for college-level courses taken in an approved secondary school if substantiated by satisfactory performance on the Advanced Placement Tests.

**College Board College-Level Examination Program (CLEP)**—See Admissions. Prior to matriculation, credit may be assigned for CLEP General Examinations passed at the 50th percentile or above. Credit may be assigned for any CLEP Subject Examinations passed at the level recommended in the College Board model policy. The General Examination in English composition and a few Subject Examinations are unacceptable for credit. After matriculation, credit for CLEP Subject Examinations will not be assigned without special authorization by the Columbian College department governing the subject involved.

**Special Departmental Examinations**—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) The student must offer evidence of sufficient background to have a reasonable command of the subject matter. Departments reserve the right to deny such requests. Credit by special departmental examination is not permitted for the first two years of college-level courses in a native language other than English. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of \$50 for each course examination is charged for preparation, administration, and grading of the examination.

### Waiving Introductory Courses by Examination

Several departments in Columbian College, including English, history, and sociology, offer periodic waiver examinations for introductory courses. Such examinations may be attempted at the option of the student; a fee of \$20 is charged. Specific departments should be consulted for further details. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

### GENERAL CURRICULUM REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of Science are admitted to a general arts and sciences curriculum until they declare a major field. Students should plan to satisfy most of their general curriculum requirements before they commit themselves to a specific major; most students select a major near the end of their sophomore year. General curriculum requirements are established by the College faculty as a whole and administered through its elected committees. Other curriculum requirements are administered by the major-field departments or programs. (Bachelor of Music candidates are admitted directly into the departmental curriculum.)

Students are obliged to demonstrate, either by course work or through examination, that they have attained a certain level of cultural literacy and intellectual competence. In the same fashion, they must also demonstrate that they have experienced the richness of liberal learning and the diversity and interrelatedness of all knowledge.



Students must satisfy these requirements in eight distinct areas and should begin to do so in their first semester, because these fundamental competences and areas of knowledge often form a basis for future course work. No course may be taken to fulfill requirements in more than one of the eight categories, even though some courses may be listed in more than one category. Students may satisfy all or part of a specific requirement either through course work or by examination.

The eight categories of general curriculum requirements are listed below along with specifically approved courses. Additional courses beyond those listed in each category may be authorized from time to time by the Curriculum Committee. Please consult the Office of the Dean, Student Services, for a supplemental list of appropriate courses prior to registration each semester. Unless otherwise specified, the indicated paired sequences of courses must be selected.

**Literacy**—6 hours: Engl 9 or 10, and 11 or 12 or 13. Unless waived, the first semester of English composition must be taken in the freshman year. The second semester (Engl 11, 12, or 13) must be taken no later than the second semester of the sophomore year.

**Quantitative and/or Logical Reasoning**—6 hours chosen from one of the following combinations: Phil 45 and 121; Stat 51 or 53 or 91, and 105 or 129; Stat 111-12 or 129-30; Math 9 and 10, 30 and 31, 30 and 41, or 51-52; Phil 45 and Stat 51 or 53 or 91.

**Conceptual Foundations and Development of Natural Science**—9 hours chosen from the courses listed below, distributed so that 3 or 6 hours come from Group A and 3 or 6 hours come from Group B (the 6-hour group must be a paired sequence): Group A: BiSc 3-4 or 11-12; Geol 1-2; Geol 5 and either 2 or 105; Group B: Chem 3-4 or 11-12; Phys 1-2 with 5-6; Phys 9-10; Phys 21-22 with 5-6.

**Social and Behavioral Sciences**—6 hours chosen from one of the following combinations: Anth 2 and 3; Anth 2 and 150; Econ 1-2; Geog 1 and 2; PSc 1 and 2; PSc 3-4; Psyc 1 and 8; Soc 1 and 2.

**Creative and Performing Arts**—3 hours chosen from the following: Art 21, 23, or 41; Comm 75; Engl 81; Mus 3, 4, 8 or applied music courses in voice, a single instrument, or jazz performance (Mus 11-50, 57-60, 153); Phil 162; TrDa 45, 46, 114, or 130.

**Literature**—6 hours chosen from one of the following combinations: Chin 163-64; Chin 181-82; Clas 107 and 108; Engl 51-52; Engl 61-62; Engl 71-72; Fren 53 and 54; Ger 51-52; Ger 103-4; Ger 112 and 114; Japn 111-12; Rel 9-10; Slav 91-92; Span 53 and 54. (Additionally, students may satisfy this requirement by completing 6 hours of course work at the 100-level in a single foreign literary tradition taught in the foreign language.)

**Western Society and Civilization**—6 hours chosen from one of the following combinations: AmCv 71-72; Art 31-32; Clas 71-72; Hist 39-40; Hist 71-72; Hmn 1-2; Phil 51-52; Rel 1-2.

**Foreign Language or Culture**—either option A or option B as follows.

**A. Foreign Language**—A student must demonstrate competence beyond the elementary level in a language other than English taught at GWU. A student offering for admission four acceptable high school units of a single foreign language (that is, four years of study of that language) has satisfied this requirement. A student who wishes to continue the same language studied in high school must take the language placement test.

In order to satisfy this requirement, the student must demonstrate competence at the level of the following courses, by either course work or examination (courses in the Romance languages must be completed with a grade of C- or



better): Chin 4 or 6; Clas 3 or 13 or 24; Fren 3; Ger 4 or 6; Ital 3; Japn 4; Kor 4; Port 3; Slav 4 or 6; Span 3.

The student should be aware that in many instances foreign languages are required for the major or recommended as preparation for advanced work. The student should consult the advisor so that foreign language may be included, as appropriate, in the student's program.

B. Foreign Culture—6 hours chosen from one of the seven categories listed below. Courses listed singly may be combined with other single courses within the same category. (1) *East Asia*—IAff 91; Chin 163–64; Hist 195; Hist 196; Japn 111–12; Rel 160. (2) *Middle East*—Anth 177; Geog 154; Hist 193; Hist 194; Rel 161. (3) *Latin America*—Anth 172; Geog 161; Hist 161; Hist 162; Hist 163–64; PSc 183. (4) *Africa*—Anth 178; Hist 116; PSc 181. (5) *Russia/Soviet Union*—Hist 145; Hist 146; Slav 71; Slav 91–92; Slav 161–62. (6) *South Asia*—Rel 157; Rel 158; Rel 159. (7) *Western Europe*—Ger 141; Hist 131–32; Hist 136; Hist 141 and 142; PSc 130.

## THE MAJOR

In order to declare a major, all students must secure the advisor's signature on a proper form (obtainable in the Office of the Dean, Columbian College Student Services) and return the form to the Office of Columbian College. No student is considered to have a major until this process is completed. Thereafter, the student receives academic guidance from a faculty advisor in the major-field department.

In most cases, filing of the approved declaration form assures the student of admission to the major declared; however, if space, equipment, or other requirements compel a department or major program to limit the number of students in that major, admission to the major may be on a selective or space-available basis.

A change in degree candidacy within Columbian College (e.g., from Bachelor of Arts to Bachelor of Science) requires the permission of the Dean. The degree requirements effective at the time the change is approved must be met.

## Bachelor of Arts

The Bachelor of Arts degree is offered with majors in the following fields:

American Civilization	East Asian Languages and Literatures
American Literature	Economics
Anthropology	English Literature
Applied Mathematics	Environmental Studies
Art History	Fine Arts
Art History/Fine Arts	French Language and Literature
Biology	Geography
Botany	Geology
Chemistry	Germanic Languages and Literatures
Chinese Language and Literature	History
Classical Archaeology and Anthropology	Journalism
Classical Archaeology and Classics	Judaic Studies
Classical Humanities	Literature in English
Computer and Information Systems	Mathematics
Criminal Justice	Music
Dance	Philosophy
Early Modern European Studies	Physics
	Political Communication
	Political Science



Program in the Liberal Arts  
 Psychology  
 Radio-Television  
 Religion  
 Russian Language and Literature  
 Russian Literature and Culture—  
     In Translation  
 Sociology

Spanish-American Literature  
 Spanish Language and Literature  
 Speech Communication  
 Speech and Hearing Science  
 Statistics  
 Statistics (Computer Science option)  
 Theatre  
 Zoology

### Bachelor of Science

The Bachelor of Science degree is offered with majors in the following fields

Applied Mathematics  
 Biology  
 Botany  
 Chemistry  
 Computer and Information Systems  
 Environmental Studies

Geology  
 Geology (Engineering option)  
 Mathematics  
 Physics  
 Statistics  
 Statistics (Computer Science option)  
 Zoology

### Field-of-Study and Departmental Majors

There are two types of undergraduate majors: the Field-of-Study major and the Departmental major. Seven majors—Classical Archaeology and Anthropology, Classical Archaeology and Classics, Early Modern European Studies, Environmental Studies, Program in the Liberal Arts, Judaic Studies, and Political Communication—although interdepartmental in nature, are governed by the regulations of the Departmental major.

Refer to the department concerned under Courses of Instruction to determine whether a major is Departmental or Field-of-Study.

#### FIELD-OF-STUDY MAJORS

Each Field-of-Study major covers a carefully worked out field of coordinated study and is under the supervision of the appropriate department and the Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, although the student is required to meet the overall general requirements for the degree. Ability to pass the Major Examination is assumed to be a convincing demonstration that the student possesses the breadth, depth, and quality of knowledge of the major usually defined in terms of semester hours, courses, and grades. Information on each field is obtainable from the department. Immediately upon declaring a major, students should consult the appropriate department so that they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual development of the individual student. Programs in the same major may vary, depending upon the individual student's background, previous study, and aptitudes. The student is expected to consult the advisor frequently, and the special proseminars offered in some fields give the student further opportunity for individual advice and direction in pursuing a program especially adapted to individual needs and abilities. A close student-advisor relationship is essential for the student's success under the Field-of-Study major plan.

*Proseminar in the Major*—A proseminar is offered in most fields to help the student acquire a coordinated knowledge of the chosen field through reading, study, and laboratory exercises. It is a presentation of the content and methods of the major field as a whole through the organization and coordination of the



knowledge obtained in the various formal courses in the major subject and of material not usually included in such courses. This course is not required by all departments, but, if it is elected, strict attendance is essential. Six semester hours, but no qualitative grade, may be assigned. When registered in this course, the student has the privilege of occasionally visiting, subject to the approval of the instructor, any other appropriate course offered in the College. (Regular attendance in a course, either for credit or as an auditor, requires registration and payment of tuition.) Proseminars are open only to the student who has been accepted as a candidate under that specific major.

*The Major Examination*—The Major Examination will normally be taken at the close of the senior year; a student on a limited schedule may take it no earlier than one calendar year before graduation. A student who fails to pass a Major Examination may, at the discretion of the Committee on Curriculum, be re-examined at a later regular major-examination period. The Committee on Curriculum has general supervision of the preparation, reading, and grading of Major Examinations. Major Examinations are held each semester on dates fixed by the department or departments concerned.

#### DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in terms of credit hours, required courses, and the attainment of grades no lower than C— in the minimum required second-group courses taken in the major field. If a student receives a grade of D in a second-group course required in the major, the major department or program may permit the course to satisfy a curricular requirement even though it would not normally count toward the minimum number of hours required for the major. However, the department or program may instead require the student to repeat the course until a satisfactory grade (C— or better) is earned. (The department chair or program director must authorize such repetition in a memo to the Office of the Dean, Student Services, before the student may register a second time.) Once the student has completed the course with a satisfactory grade, credit hours earned the first time the course was taken will count toward the minimum number of hours required in the major. Credit earned for the repetition will not count toward the degree. The minimum specific requirements for Departmental majors are listed below the staff of instruction of the department concerned. The chairman of the department, or designated departmental advisor, should be consulted at registration concerning the student's program of courses; and the entire program, including electives, must be approved by the department. The student is also expected to consult the chairman or advisor in all matters affecting the program of studies, such as changes, substitutions, or withdrawals, and especially concerning the student's progress in a course. A close student-advisor relationship is desirable.

#### Double Majors

With the prior approval of the departments concerned, a student who completes the requirements of two major fields in Columbian College (for example, mathematics and physics, or English and French, or history and economics) may graduate with a double major. Such a student should consult with advisors in the two departments concerned and officially declare both majors on the appropriate form available in the dean's office. A double major must be taken in departments offering the same degree (either the B.A. or the B.S.); a major field in Columbian College cannot be combined with a major field offered by another degree-granting unit of the University.



### Interdisciplinary Programs

*Regular Interdisciplinary Programs*—Programs include American Civilization, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Early Modern European Studies, Environmental Studies, Judaic Studies and Political Communication.

*Special Interdisciplinary Programs*—A student who finds no existing major program suited to individual educational goals may develop a special major program, in consultation with appropriate departmental advisors. Final approval of such a program rests with the Committee on Curriculum. Only programs with valid and clearly defined academic goals will be approved, and each shall be designated by a title suggested by the student to the Committee on Curriculum for approval. At least 45 semester hours of credit of the approved program must be completed in Columbian College. Because of their broad scope such interdisciplinary majors may not be combined with a double major.

A student in an interdisciplinary program will be expected, during the second semester of the senior year, to take a comprehensive examination (either oral or written) in the interdisciplinary field, or to undertake a senior comprehensive thesis, at the discretion of the student's interdepartmental committee.

*Special Interdisciplinary Courses*—Under the supervision of the Committee on Curriculum, new courses combining the methods and insights of several disciplines will be offered each semester. Interested students should consult the current *Schedule of Classes*, where such courses are numbered in the 700s. A student wishing to use any of these courses to satisfy the general curriculum requirements should consult the sponsoring department.

*Program in the Liberal Arts*—Directed by the Curriculum Committee of Columbian College of Arts and Sciences, this program is designed to provide a general education in the liberal arts, with or without another major, as the student chooses. It offers opportunity for achieving a substantial acquaintance with each of the three divisions of knowledge through a selection of courses that cultivate a broad perspective in time and in national and/or cultural traditions. The committee appointed to advise students in the program consists of one representative each from the humanities, the social sciences, and the natural and mathematical sciences. For curriculum requirements, see Program in the Liberal Arts, under Courses of Instruction.

### MINORS AND SECONDARY FIELDS

#### Minors

Students who wish to familiarize themselves with a field outside their major may graduate with a minor in addition to the major. Not all Columbian College departments offer undergraduate minors; the requirements prescribed by those that do are listed under the department involved. A student interested in a minor should consult faculty advisors in the department concerned and declare both major and minor programs on the appropriate form available in the dean's office.

At least one-half of the course work required for a minor must be done in residence. Grades of C- or better must be earned in second-group courses including such courses transferred as advanced standing from another institution. Courses passed with a grade below C- may be used to fulfill a minor field curricular requirement but may not be counted toward the total number of credit hours required for the minor.

When taken by a student enrolled at the University in a school other than Columbian College, such minors are designated secondary fields. The same



curricular and scholarship requirements apply to secondary fields as to minors. Minors are available in the following fields:

American Civilization	Japanese
Applied Ethics	Journalism
Archaeology	Judaic Studies
Art History	Literature in English
Art History/Fine Arts	Mathematics
Biological Anthropology	Music
Biology	Philosophy
Botany	Physics
Chemistry	Political Science
Chinese	Psychology
Classical Humanities	Religion
Creative Writing	Russian Language and Literature
Cross-Cultural Communication	Russian Language and Culture— In Translation
Dance and Dancing	Sociocultural Anthropology
Dance Education	Sociology
Dance History and Criticism	Spanish Language and Literature
Economics	Speech Communication
Fine Arts	Speech and Hearing
French Language and Literature	Statistics
General Anthropology	Statistics (Computer Science option)
Geography	Theater
Geology	Women's Studies
German	Zoology
History	

### Secondary Fields

Just as students enrolled at the University but outside the College may pursue College minors as secondary fields, such study is permitted College students in other schools of the University. Secondary fields are available in the School of Education and Human Development in early childhood education, exercise and sport, human services, secondary education (preparation for certification), special education, and tourism studies; in the School of Engineering and Applied Science in computer science, electrical engineering, engineering analysis, operations research, and engineering administration; in the School of Government and Business Administration in business administration; and in the Elliott School of International Affairs in international affairs. Interested students should consult with their academic advisors.

Columbian College students are limited in the number of hours they may take in courses outside the College (so-called "professional credit" courses). Refer to the paragraph below.

### OTHER ACADEMIC REGULATIONS

#### Courses Outside Columbian College

Courses in schools of the University other than Columbian College may be taken to fulfill curriculum requirements, with approval of the major department, subject to Columbian College rules governing allowable hours of professional credit.

Except for majors in applied mathematics and students in Naval Reserve Officers Training Corps programs, no more than 9 semester hours of courses offered by degree-granting divisions of the University other than Columbian



College may count toward bachelor's degrees in Columbian College. (No credit allowed toward the degree for ExSA courses.) Students who have extraordinary reasons for exceeding the 9-hour limit must receive prior approval from the dean. In the case of those pursuing a secondary field, there is an 18-hour limit, and prior approval of the dean is not required.

No more than 45 semester hours of courses completed by a student while in nondegree status in the Division of Continuing Education may be applied toward a degree in Columbian College.

**Naval Science**—For information on naval science courses and the Naval Reserve Officers Training Corps, see Naval Science, under Courses of Instruction.

### **Service-Learning Program**

A maximum of 15 semester hours in Service-Learning Program courses may be credited toward bachelor's degrees in Columbian College.

### **Earning an Additional Semester Hour of Credit**

Normally, no deviation is permitted from the number of semester hours of credit given in parentheses after the title of each course. In exceptional circumstances, however, and with the prior approval in writing of the instructor and the dean, a student may register for and earn an additional semester hour of credit in certain appropriate second-group (upper-division) courses by doing a significant amount of extra work as assigned and supervised by the instructor.

### **Pass/No Pass Option**

A junior or senior student in Columbian College who is in good standing may, with the approval of the advisor and the dean, take one course a semester and receive a grade of P, Pass, or NP, No Pass. No student will be allowed to take more than four pass/no pass courses under this regulation. The student may, however, also receive grades of P/NP in the proseminar for field-of-study majors and in other courses normally using such grades. A student must sign up for the pass/no pass option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of the drop period or the eighth week of class. Courses required for the College's general curriculum requirements or in the student's major or minor field (including those courses required for the major that are offered by other departments) may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment in this University.

### **Tutorial Study**

A junior or senior of demonstrated capacity, with a special interest in the subject matter of a regularly listed course, may be permitted to take tutorial study in residence under the personal direction of the instructor, in accordance with the rules of the appropriate department and with the approval of the dean. Credit under this plan is limited to the specific semester hours of credit designated for each course in the list of courses of instruction. It assumes frequent and regular conferences between the student and instructor.

### **PREMEDICAL CURRICULUM**

A premedical student who intends to work toward a bachelor's degree fulfills the general requirements of Columbian College stated above and may follow the major-field curricula of any Columbian College department. Each premedical



program must be approved by the premedical advisor. For admission to most medical schools, the student must have a minimum of 90 semester hours applicable toward a degree in an approved college of arts and sciences; the 90 hours must include

1. *Biology*: 8 semester hours, including laboratory. This may be either in general biology or zoology but may not include separately credited courses in botany.
2. *Chemistry*: 8 semester hours of general inorganic chemistry (which may include qualitative analysis), including laboratory, and 6-8 semester hours of organic chemistry, including laboratory.
3. *Physics*: 8 semester hours, including laboratory.
4. *English*: 6 semester hours. This may be the usual introductory English composition course or its equivalent.

Many medical schools have additional entrance requirements, among which are courses in biochemistry, embryology, histology, genetics, and mathematics. Even when such courses are not actually required, they are strongly recommended.

With the exception of these specific requirements, applicants are urged to follow their personal interests in developing their premedical courses of study. A well-balanced program, rather than a specific field, is the criterion by which an applicant is judged. It is not advisable to take courses that appear to cover subject matter in the medical program.

Although well-qualified candidates are eligible for admission after completing the minimum 90 semester-hour requirement, the majority of applicants are found to be better prepared for the study of medicine after four years of college work.

### PREPARATION FOR LAW SCHOOL

A broad liberal education is the best undergraduate preparation for law school. Columbian College, therefore, does not prescribe a prelegal curriculum. However, through its Office of Student Services, the Columbian College provides students with advice about academic preparation for law school.



## GRADUATE SCHOOL OF ARTS AND SCIENCES

Dean H. Solomon

Associate Dean E.A. Caress

Assistant Deans A.D. Andrews, D.A. Rowley, C.E. Rice

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W.H. Adey, S.L. Adhya, M. Bloomfield III, T.E. Bowman, R.E. Burke, W.H. Carter, Jr., J.H. Cassidy, T.A. Cebula, R.Y. Dodd, C.D. Emrick, G.N. Grob, L. Harvath, N. Hotton III, R.S. Houbbrick, M.T. Inge, M.C. Jaye, J.E. Keirans, K.L. Kirk, E.O. Major, P.B. Mislivec, B.C. Myhr, M. Nirenberg, J. Petricciani, A.D. Steinberg, K. Stromberg, J.D. Suarez-Torres, D.L. Terrell, H.J. Viola, R. Zagarri

#### HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advanced study and research leading to Master's degrees in the arts and sciences and the degree of Doctor of Philosophy. Graduate programs at George Washington University were first formally organized under the Graduate School in 1905, following several decades of gradual growth in a number of departments. In 1930 the Graduate School was discontinued. Columbian College, the University's liberal arts college, then assumed responsibility for the Master of Arts and Master of Science degrees, and a newly created Graduate Council administered all Doctor of Philosophy programs. Professional schools took responsibility for advanced degrees in the professional fields.

In 1967 the Graduate Council and the Graduate Division of Columbian College were consolidated into a new Graduate School of Arts and Sciences. All graduate programs in the arts and sciences leading to the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, and Doctor of Philosophy are under the Graduate School. In addition, a Master of Philosophy degree is awarded by the School, upon recommendation of the appropriate department, to students who have successfully completed the *General Examination* for the Doctor of Philosophy degree.

The School is under the direction of the Graduate Faculty of Arts and Sciences. It is the responsibility of the Faculty to set the requirements for admission to the School, to provide courses and programs of study and research for its students, to establish academic standards for its degrees, to recommend to the Board of Trustees the awarding of degrees, to lay down regulations as needed for the operation of the School, and generally to supervise its activities.

The administration of the School is vested in the dean, who is chairman of the Dean's Council, which is responsible to the Faculty of the School for all policy matters.



### ADMISSION REQUIREMENTS

Application forms for admission to graduate study are obtained from the office of the dean of the Graduate School of Arts and Sciences. When completed, these application forms must be submitted to this office, together with college transcripts, letters of reference, and other information as required by the department or program. Admission is dependent on departmental recommendation and approval by the dean.

Applicants must have academic backgrounds of excellence, usually with majors, or equivalent, in the fields in which they intend to study for advanced degrees. Normally, a B average (or equivalent) from an accredited college is required. With evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of a B average may be accepted as a probationary student. The minimum does not assure automatic acceptance. The departments may, and often do, set higher admission standards. Moreover, the number of spaces available for new graduate students limits the number that can be accepted. Students who apply in their senior year must have completed their baccalaureate work before registration in the Graduate School and must present evidence of such completion.

Applicants to Ph.D. programs are required to submit scores on the GRE general test. Some master's programs also require the GRE general test (see the Departmental Requirements section of the application package).

Applicants who are not U.S. citizens must submit scores on the TOEFL or the GRE general test in accordance with the following requirements:

1. Applicants for graduate teaching assistantships who are from countries in which the official language is not English are required to submit scores on the TOEFL and the Test of Spoken English (TSE).
2. Applicants who received their baccalaureate degrees, or equivalent, from institutions in which the language of instruction is not English must submit TOEFL scores.
3. Applicants to Ph.D. programs and to master's programs requiring the GRE general test who have received their baccalaureate degrees, or equivalent, from institutions in which the language of instruction is English may submit scores on either the GRE general test or the TOEFL. GRE scores are preferred.
4. Applicants to master's programs that do not require the GRE general test who earned their baccalaureate degrees, or equivalent, from institutions in which the language of instruction is English are not required to submit GRE or TOEFL scores.

In addition, some programs require scores on a GRE subject test from all applicants (see the Departmental Requirements section of the application package).

The applicant must have the Educational Testing Service send the required score reports directly to the Graduate School of Arts and Sciences.

All applicants from countries in which the official language is not English who are admitted as degree candidates in the Graduate School of Arts and Sciences will be required to take the English as a Foreign Language (EFL) placement test at George Washington University before registering. EFL course work may be required depending on the applicant's performance on the placement test.

**Application for Admission**—Applicants who are requesting fellowship support must submit completed applications by the dates indicated on the Graduate School's application information. Completed applications for graduate study without fellowship support must be received by July 1 for the fall semester, by



November 1 for the spring semester, and by April 15 for the summer sessions, unless otherwise noted on the Graduate School's application information.

**Readmission**—A student who wishes to resume a graduate program that had been interrupted must file an application form to be considered for readmission. Readmission is not guaranteed, and the application is subject to review by the department concerned and the dean. The student may be required to take qualifying examinations on the course work completed. Application forms are available in the Graduate School Office.

## REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulations.

In addition, the Graduate School publishes a Student Handbook each academic year which contains updated information on the School's policies, regulations, and other matters of concern to enrolled or admitted students. It is the responsibility of the student to be aware of the information contained in this Bulletin and the Handbook.

### Grades

Grades for graduate work are A, Excellent; B, Good; C, Minimum Pass; F, Fail; I, Incomplete; IP, Progress; W, Authorized Withdrawal, Z, Unauthorized Withdrawal; CR, Credit.

The grade of I indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work for a course. The incomplete must be made up before the lapse of one calendar year. An Incomplete for regular course work that is not changed within one calendar year remains permanently as a grade of I on the student's record. The grade of I cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

The grade of IP is given for all thesis and dissertation research courses until the thesis or dissertation is completed. Upon the satisfactory completion of the thesis or dissertation, the grade IP is changed to CR automatically. The grade of CR is given for Advanced Reading and Research courses.

### Scholarship Requirements

Graduate students are required to maintain a minimum cumulative grade average of B (3.00) in all course work taken following admission to the Graduate School. Individual departments may require a higher average. The Department of English requires a 3.25 average. Only graduate course work taken at the University that forms part of the student's program of study may be included in the cumulative grade average.

In the case of a student who receives a grade of F for a course in the program of studies, the Graduate School will require a written statement from the department justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. When a grade of F is received for a course in the program of studies, the grade is included in the student's grade point average whether or not the course is repeated.

A student may repeat a course in which a grade of C or above was received only when permitted to do so by the department concerned, unless the course description states that the course may be repeated for credit. A written statement to this effect must be submitted for approval to the dean's office by the appropriate departmental advisor. It is then filed with the Registrar. If a course is repeated,



the first grade received remains on the student's record and is included in the student's grade point average.

A graduate student may take an advanced undergraduate course (course numbered 101-200) for graduate credit only upon the approval of the dean and the department at the time of registration. Such approval is granted only with the provision that the student complete additional work in order to receive graduate credit.

### **Program of Studies**

The program of studies is a formal statement of the requirements to be met in completing a specific degree program as well as the dates by which each requirement must be completed. The program of studies form is obtained from the Graduate School at the time of the first registration. It must be completed in consultation with the departmental advisor and submitted for approval to the Graduate School by the indicated date. A master's candidate's program of studies is due during the first semester of study, and a Ph.D. candidate's program of studies is due during the second semester of study. A program of studies may be revised, when necessary, by obtaining the approval of the departmental advisor and the dean. The revision must be filed in the Graduate School office. A completed course cannot be dropped from the program of studies unless its inclusion was due to an error in advising or an administrative error. Such a change in the program requires the approval of the dean.

**Probationary Students**—It is especially important for those admitted as probationary students to consult with their departmental advisor as early as possible regarding completion of additional requirements specified in the letter of admission. The exact conditions for admission of probationary students must be satisfied.

**Academic Work Load**—Full-time students register for 9 to 12 semester hours each semester; part-time students must register for 6 semester hours each semester. Students who work more than 20 hours per week must be part-time students. These requirements do not apply to students who have fewer than 9 semester hours (full time) or 6 semester hours (part time) remaining to complete their programs. No more than 15 semester hours may be taken during any one semester. Students who are employed more than 20 hours per week are expected to apply for part-time academic programs, and they will not be permitted to register for more than 6 credit hours in any semester.

### **Continuous Enrollment**

All students must be continuously enrolled while working toward a degree except during the summer sessions. Students who have completed all course work, thesis, and dissertation registration requirements and are within their program of studies deadline must register for Continuous Enrollment each semester during the registration period. If continuous enrollment is not maintained, the student is dropped from the degree program unless a leave of absence is granted by the Graduate School.

### **Leave of Absence**

A student who, for personal reasons, is temporarily unable to continue the program of studies may request leave of absence for a specific period of time, not to exceed one calendar year during the total period of degree candidacy. When the period of leave has expired, it is the student's responsibility to register for the next semester. If a student fails to register, degree candidacy is terminated.



### Withdrawal

Graduate students who intend to withdraw from the Graduate School should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

### Graduation Requirements

All students must file an Application for Graduation by the date indicated in the University Calendar for the semester or summer session in which they intend to graduate. Students must be registered in the Graduate School during the semester they plan to graduate. Degree candidates may graduate in May, February, or September. Students who have completed the requirements for a degree but have not yet been awarded the degree will be issued a letter to this effect upon request.

### DEGREES

Listed below are the degree programs of the Graduate School of Arts and Sciences and the specific degrees offered, by field. The programs are directed by the departments concerned. Degree programs that bridge two or more departments are directed by committees composed of members of the departments concerned. For further information write to the dean or the chairman of the appropriate department.

Students with special academic goals may pursue individualized programs of study toward the Master of Arts or Master of Science, subject to approval by the Committee on Individual Programs and the dean. Courses must be drawn from a minimum of three fields, with a maximum of 18 hours from any one field. A majority of courses must be taken within the Graduate School of Arts and Sciences. The comprehensive examination is a final essay in which the integration of the program of study is demonstrated. The School also offers Master of Arts and Master of Forensic Sciences degree programs in specific academic areas at off-campus locations.

### Graduate Fields

The graduate course work offered in support of the degree programs in the following list is shown by department in this *Bulletin*.

I. Humanities	Degrees Offered	
American Civilization	M.A.	Ph.D.
American Literature	M.A.	Ph.D.
Art	M.F.A.	
Ceramics		
Design		
Painting		
Photography		
Printmaking		
Sculpture		
Visual Communication		
Art History	M.A.	Ph.D.
English Literature	M.A.	Ph.D.
Museum Studies	M.A.	
Music	M.A.	
Music (Performance)	M.Mus.	
Theatre	M.F.A.	
Women's Studies	M.A.	



**II. Social Sciences**

Administrative Sciences	M.A.	
Anthropology	M.A.	
Criminal Justice	M.A.	
Economics	M.A.	Ph.D.
Geography	M.A.	
History	M.A.	Ph.D.
Legislative Affairs	M.A.	
Political Science	M.A.	Ph.D.
Public Policy	M.A.	Ph.D.
Public Policy	M.A.	
Environmental and Resource Policy		
Gerontology		
Philosophy and Social Policy		
Women's Studies		
Sociology	M.A.	Ph.D.
Telecommunication	M.A.	

**III. Physical and Mathematical Sciences**

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemical Toxicology	M.S.	
Chemistry	M.S.	Ph.D.
Environmental Science	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geobiology	M.S.	Ph.D.
Geochemistry	M.S.	Ph.D.
Geology	M.S.	Ph.D.
Mathematical Statistics	M.A.	
Mathematics	M.A.	Ph.D.
Physics	M.A.	Ph.D.
Statistical Computing	M.S.	
Statistics		Ph.D.

**V. Biomedical and Related Sciences**

Anatomy		Ph.D.
Art Therapy	M.A.	
Biochemistry	M.S.	Ph.D.
Biological Sciences	M.S.	Ph.D.
Biology		
Botany		
Zoology		
Clinical Microbiology	M.S.	
Genetics	M.S.	Ph.D.
Microbiology	M.S.	Ph.D.
Pathology		Ph.D.
Pharmacology	M.S.	Ph.D.
Physiology	M.S.	Ph.D.
Psychology	M.A.	Ph.D.
Speech-Language Pathology and Audiology	M.A.	

**Joint Master of Science-Doctor of Medicine Program**

Students interested in the joint Master of Science and Doctor of Medicine program must meet the requirements for admission to the Graduate School of Arts and Sciences and to the Doctor of Medicine degree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 semester hours of credit. A maximum of 12 semester hours of credit for graduate-level course



completed as a part of the Doctor of Medicine degree curriculum (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining 18 semester hours of work, which in most programs includes a thesis, must be work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

#### **Joint Master's-Juris Doctor Program**

Students interested in working concurrently toward the Juris Doctor degree in the National Law Center and a master's degree in the Graduate School of Arts and Sciences must meet the requirements for admission to both schools and all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

#### **Joint Doctor of Medicine-Doctor of Philosophy Program**

A joint program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements that must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum of 24 semester hours of approved course work in the School of Medicine and Health Sciences toward the minimum of 48 hours of course work required to qualify for the General or Cumulative Examination for doctoral candidacy. This course work is normally taken during the semesters that alternate with the medical program and in the years following the award of the M.D. degree. The student's research for the dissertation may begin concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for the completion of this dual program is six years.

In order to enter the joint program, a prospective student must first apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the joint program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee.

### **REQUIREMENTS FOR THE DEGREES**

#### **The Master's Programs**

Unless otherwise specified, the requirements listed below are applicable to candidates for the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, and Master of Science in Forensic Science.

1. **General Requirements**—For a master's degree program including a thesis, the satisfactory completion of a minimum of 30 semester hours of approved graduate work, including 6 semester hours of thesis research, is required. For a master's degree program that does not include a thesis, the number of semester hours of approved graduate course work is determined by the department and normally consists of from 30 to 36 semester hours. The program without the thesis is not an individual student option and is not available in every department. Departments can and often do set requirements above the minimum required by the Graduate School.



Work taken to make up deficiencies is never counted as part of the requirements leading to a master's degree. Upon approval, up to one-half of the required graduate work may be taken in courses offered by the other affiliated institutions of the Consortium of Universities of the Washington Metropolitan Area, Inc., or by another degree-granting division of this University. If credit is transferred from another institution (see Transfer of Credit, below), the number of semester hours which may be taken at an affiliated Consortium institution is reduced by the number of hours accepted as transfer credit.

All master's degree candidates must complete degree requirements by the calendar date specified in the program of studies, which in no case will exceed four years. Extensions beyond the specified time period may be granted in exceptional circumstances, but the student will be required to register and pay for 6 credit hours of Reading and Research each semester.

2. *Transfer of Credit*—A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the Graduate School from the Division of Continuing Education, another degree-granting division of this University, or another accredited college or university. For a transfer of credit to be approved, all of the following conditions must be met: the course work must have been taken prior to admission to the Graduate School; it must be approved as part of the student's program of studies; it must not have been applied to the completion of requirements for another degree; it must be post-baccalaureate graduate-level course work; it must have been taken within the past two years; and the student must have received a grade of B or better in each course for which a transfer of credit is requested. This action must be requested in writing and approved by the departmental advisor and the dean. A transcript of the course work must be on file before the request can be considered.

3. *Special Program Requirements*—Master's degree candidates in some programs must demonstrate a reading knowledge of an appropriate foreign language. In other programs, students must demonstrate competence in quantitative methods, normally by passing prescribed courses in Statistics/Computers and Information Systems. Other programs have special requirements in other subjects. Courses taken at the undergraduate level to fulfill these requirements may not be counted in the number of graduate credit hours required for these programs. For further information on these and other regulations, consult the Student Handbook and the departments and program faculty concerned.

4. *The Thesis*—The main purposes of a master's thesis are to demonstrate the student's ability to make independent use of information and training and to furnish objective evidence of constructive powers in a chosen field. The student registers for six semester hours of thesis research and must complete the thesis no later than four calendar years after the initial registration. Registration for thesis research entitles the student to the advice and direction of the member of the faculty under whom the thesis is to be written. The thesis subject must be approved by the faculty member who will be directing the thesis. The thesis—in its final form, with one copy and a certificate of approval signed by the thesis director and by at least one departmental reader—must be presented to the dean no later than the date announced in the University Calendar. All theses must meet the form, style, and other requirements set forth in a pamphlet, *Information Concerning Master's Theses and Doctoral Dissertations*, available in the Graduate School office.

5. *Master's Comprehensive Examination*—Most master's degree candidates must pass a Master's Comprehensive Examination in the major subject. Examinations are held on dates fixed by the departments, so that results can be filed in the Graduate School office no later than the day before the faculty meets to



approve the list of graduates. The nature and form of the examination is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examination may, with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

### **The Doctor of Philosophy Program**

The minimum requirements for the doctoral program are as follows:

1. **General Requirements**—The program leading to the degree of Doctor of Philosophy requires the satisfactory completion of a minimum of 72 semester hours of approved graduate work for entering students whose highest earned degree is a baccalaureate. A minimum of 48 of these hours must be taken in preparation for the General Examination. Entering students whose highest earned degree is a master's degree are required to register for a minimum of 48 semester hours of approved graduate work, no fewer than 24 of which must be taken in preparation for the General Examination. While completing the dissertation portion of the program, the student must register for 12 to 24 semester hours of dissertation research, depending on the number of hours completed prior to the General Examination. The exact number of semester hours required for any part of the total program is assigned by each department and may exceed the minimum required by the Graduate School.

Doctoral degree candidates have an overall eight-year time limit for completion of all degree requirements. Doctoral students in the first unit of their programs shall meet the calendar deadline for completing this unit as specified in the program of studies. Completion of the first unit includes satisfactory completion of course work and the General Examination. Doctoral students in the second unit of their programs, i.e., dissertation research, shall have an approved topic on file in the Graduate School office by the date specified in the program of studies, which in no case will exceed two years from the completion date of the General Examination. All remaining doctoral degree requirements shall be completed by the date specified in the program of studies, which in no case will exceed five years from the completion date of the General Examination. If any of the deadlines specified above are not met, assuming academic approval for an extension, which may be granted in exceptional circumstances, the student must register and pay for 6 credit hours of Reading and Research each semester. These hours will not be counted toward completion of the degree.

2. **Transfer of Credit**—Entering students who hold a master's degree may request transfer of up to 24 semester hours of credit toward a doctoral degree for acceptable post-baccalaureate graduate work taken at the master's degree level at George Washington University or another accredited college or university. For those who do not hold the master's degree, a maximum of 12 semester hours of credit may be transferred, provided the conditions detailed above are met.

3. **Special Program Requirements**—Certain doctoral programs require a reading knowledge of one or two appropriate foreign languages, or high proficiency in one language. Some require a reading knowledge of one language in addition to competence in quantitative or other subject matter; some require competence in other subject matters without a language requirement. Competence in quantitative methods is normally demonstrated by passing certain prescribed courses in Statistics/Computer and Information Systems. Courses taken at the undergraduate level to fulfill special program requirements may not be counted in the number of graduate credit hours required for the student's doctoral program, except that up to 6 hours of course work at the 100 level may be so counted, with



the approval of the department and the dean, so long as the number of hours of dissertation credit in the student's program is 12 or more. For further information on these and other regulations, consult the Student Handbook and the departments and program faculty concerned.

4. *The General Examination*—Each student is required to complete the General Examination no later than the semester following the completion of course requirements. The General Examination is composed of a written examination five to six hours in length in each of the areas of study comprising the student's total program; the time permitted between each examination is determined by the administering department. Some departments permit one or two areas of study to be "written off"; that is, a special, shorter examination is given after one year of course work in the area. A cumulative examination system is in effect in the fields of chemistry and physiology, and in the field of psychology a system of two comprehensive examinations is used. Students in these fields should consult the appropriate department for information about its system.

A student who fails to pass any part of the General Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

Satisfactory performance on the General Examination is required for admission to the second unit of the Doctor of Philosophy degree program, consisting of the dissertation and final examination. Admittance to the second unit is permitted only if the student's General Examination committee finds that the student's performance on the examination and in course work gives a good indication of success in the second unit. Passing of the examination at the minimum level does not necessarily give this indication.

5. *The Degree of Master of Philosophy*—Upon departmental recommendation and approval of the dean, the degree of Master of Philosophy may be awarded to students who have successfully completed all requirements for the Doctor of Philosophy degree up to and including the General Examination and have been approved for the second unit. Not all departments recommend students for the degree.

6. *The Dissertation and Final Examination*—A dissertation is required of each doctoral candidate as evidence of ability to perform scholarly research and interpret its results. The candidate normally enrolls for Dissertation Research upon completion of the General Examination; however, the candidate may register for up to 6 semester hours of Dissertation Research during the time the General Examination is being completed. If the dissertation is not completed within five years from the date the General Examination is completed, the student will be required to retake the General Examination.

No later than the date specified in the University Calendar, the candidate must submit to the dean the original and one copy of the dissertation and an abstract for inclusion in the Announcement of the Final Examination and for reproduction by University Microfilms, Inc.

When the dissertation has been approved by the director, two members of the Doctoral Program Committee, and the dean, the candidate takes the Final Examination, an oral examination that is open to the public. A committee of examiners (composed of Graduate School faculty and, when appropriate, outside scholars) conducts the examination. A sufficient number of copies of the dissertation must be provided by the candidate for the members of the Examination Committee. If the candidate passes, he or she is recommended by the Graduate School for the degree of Doctor of Philosophy.



Detailed information regarding regulations for the form and reproduction of the dissertation is available in the Graduate School office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee that is applied toward the expense of printing the Announcement of the Final Examination and the basic service rendered by University Microfilms, Inc.

### FELLOWSHIPS AND FINANCIAL AID

A limited number of graduate teaching assistantships and University Fellowships are available in most departments of instruction to students registered in the Graduate School of Arts and Sciences. Other kinds of sponsored and University awards are also available. Awards are based on academic excellence, and only full-time degree candidates in the Graduate School are eligible to be considered. Appointments are made on a year-to-year basis and are not automatically renewable.

Students applying for admission who also wish to apply for a fellowship should submit the fellowship application and the application for admission by February 15; the necessary transcripts, Graduate Record Examination scores, and letters of recommendation should also be on file by this date. Students currently enrolled in the Graduate School should submit the fellowship application by February 15 and should check with their departments concerning additional application requirements.

International students applying for teaching assistantships should refer to Financial Aid, International Students, for regulations governing the appointment of international graduate teaching assistants.

Forms are available at the office of the Graduate School of Arts and Sciences. Filing the fellowship application entitles the student to consideration for all awards available in the student's department.

Students who wish to apply for loans should indicate their intent to do so on the application for admission. Information concerning loans is contained in a booklet available from the University's Office of Student Financial Aid.

### COOPERATIVE PROGRAMS

The American Studies Program at George Washington University has made a cooperative arrangement with the American Studies Program of the Smithsonian Institution. Members of the staffs of the Smithsonian's American Studies Program, National Museum of American History, National Portrait Gallery, and National Collection of Fine Arts offer seminars and tutorial instruction in fields that provide students with an unusual opportunity to develop new dimensions in the discipline of American civilization. This program of study is open to students working toward the degrees of Master of Arts and Doctor of Philosophy and is intended to prepare them for research, teaching, and museum-related careers.

The Art Department of George Washington University has made arrangements with the Smithsonian Institution to offer graduate programs of study and research in museum studies leading to the degree of Master of Arts in the field of art history with a concentration in museum training. The Department has made similar arrangements with the Corcoran Gallery of Art, the Freer Gallery, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

For further information concerning these programs, contact one of the following offices at George Washington University: the Graduate School of Arts and



Sciences for those who are interested in any of the fields listed above, the Department for those interested in art museum training, the American Studies Program for those interested in the field of American civilization.

George Washington University, in cooperation with two other universities and the Folger Shakespeare Library, helped establish the Folger Institute for Renaissance and 18th-Century Studies as a cooperative venture in graduate studies in the humanities. Fifteen universities are now member institutions. Seminars (limited to 12 students each) are offered each semester under the direction of American and foreign scholars. The Folger Library forms the core of the Institute. All participants enrolled in the seminars are granted access to the collections of rare books, manuscripts, and reference materials of the Library. All registered students are eligible to apply for admission to one or more of the seminars, although priority in enrollment will be accorded graduate students working on dissertations and postdoctoral scholars from the sponsoring institutions. Further information, including a listing of seminar topics, is available at the Folger Shakespeare Library.

#### CENTER FOR WASHINGTON AREA STUDIES

The Center for Washington Area Studies serves as the focal point at the University for interdisciplinary work related to Washington and its regional context. Through teaching, advanced research, publications, and public events that include tours, exhibits, and conferences, the Center works to promote a better understanding and appreciation of the history, culture, literature, and public policies of the Washington region.

#### OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering the following degree programs off campus: the Master of Arts in the fields of Administrative Sciences, Criminal Justice, Legislative Affairs, and Telecommunication and the degree of Master of Forensic Sciences. Not all of these programs may be available in any given year.

#### SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Dean L.D. Leonard

Associate Dean J.R. Shotel

#### FACULTY 1988-89

Professors J.G. Boswell, L.J. Breen, F.J. Brown, M.A. Burns, M.S. Castleberry, D.W. Dew (Research), R. Ferrante, J.D. Fife, E.J. Gleazer, Jr. (Visiting), Greenberg, D. Hawkins, J.C. Heddesheimer, C.D. Holden, D.H. Holmes, Horrorth, R.N. Ianacone, R.K. Ives, E.W. Kelly, Jr., L.D. Leonard, D. Liebowski, A.J. Mazur, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, M. Phelps, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. Snodgrass, C.E. Vontress, Winkler, M.J. Worth



Associate Professors N.E. Chalofsky, N.M. Dixon, M.B. Freund, C.H. Hoare, T.J. Rosegrant, D.M. Saunders, G.E. Schou, N.J. Sobel  
 Assistant Professors S.S. Beck (Visiting), L.H. Cuenin, E.S. Fabian, W.F. Lynch, L.H. Mauro, H. Nashman, N.B. Paley, L.R. Putnam, J.M. Taymans  
 Instructors S.W. Dennis (Visiting), T.K. Ginter (Visiting), T.J. Martin, E.C. Rach, S.E. Spivack (Visiting), C.B. Stapp, P.A. Sullivan (Visiting)

#### Members of the Advanced Graduate Faculty

J.G. Boswell, J.L. Breen, F.J. Brown, M. Burns, M.S. Castleberry, N.E. Chalofsky, N.M. Dixon, R. Ferrante, J.D. Fife, M.B. Freund, J.A. Greenberg, D. Hawkins, J.C. Heddesheimer, C.H. Hoare, D.H. Holmes, G. Horrworth, R.N. Ianacone, R.K. Ives, E.W. Kelly, Jr., L.D. Leonard, D. Linkowski, A.J. Mazur, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, L.R. Putnam, M.N. Rashid, D.M. Saunders, J.R. Shotel, G.W. Smith, J.E. Snodgrass, N.J. Sobel, J.M. Taymans, C.E. Vontress, L. Winkler

#### Committees\*

##### EXECUTIVE COMMITTEE

J.G. Boswell, J.C. Heddesheimer, R.N. Ianacone, A.J. Mazur, E.C. Rach, J.E. Snodgrass, C.E. Vontress

##### CURRICULUM COMMITTEE

M.S. Castleberry, E.S. Fabian, D.H. Holmes, W.F. Lynch, A.J. Mazur, D.C. Paup, D.M. Saunders, P.A. Sullivan, L. Winkler

##### FACULTY COMMITTEE

R. Ferrante, M.B. Freund, C.H. Hoare, W.F. Lynch, D.C. Paup, D.M. Saunders, L. Winkler

##### SCHOOL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

L.H. Cuenin, J.D. Fife, C.H. Hoare, H. Nashman

##### STUDENT COMMITTEE

E. Fabian, D.M. Saunders, P.A. Sullivan, J.M. Taymans, three student members

#### INTRODUCTION

The University began offering professional courses for teachers in 1904-5, and in 1907 it established a Division of Education. In 1909 the Division of Education became the Teachers College, which in its early years was concerned largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education and greater provision was made for advanced study. Since that time the School has continued to grow; it now comprises a broad range of graduate and undergraduate programs. To reflect the current scope of its offerings, the name of the School was changed in 1978 to the School of Education and Human Development.

The School of Education and Human Development prepares teachers, human service and service industry personnel, resource and support personnel, and

\* The dean and the associate dean of the School of Education and Human Development are ex officio members of all committees.



administrators for professional service. The School also offers opportunities for experienced professionals to extend and enrich their education. The programs are designed to meet the broad needs of persons who seek knowledge and skills necessary to provide effective learning and teaching, research, services, and leadership in a variety of settings. The School's programs address the needs of persons interested in careers in elementary and secondary schools but also include the preparation of individuals for all areas of education and human development, covering the life span from pre-school through the adult years, both the public and private sectors of society.

Thus, a degree in Education and Human Development is not only a preparation for teaching in schools but also for careers in a variety of public and private human service and service industry settings. A significant portion of the required courses are in the liberal arts. In addition, the programs provide opportunities for students to develop critical thinking and reasoning, as well as leadership, organizational, and planning skills. Emphasis is placed upon developing the human relationship qualities that are essential in fields that require involvement with people in all age ranges and from all walks of life.

The School of Education and Human Development is the administrative unit for four departments: Educational Leadership, Human Services, Human Kinetics and Leisure Studies, and Teacher Preparation and Special Education. In addition to programs of study leading to its degrees, the School offers credit and noncredit workshops designed specifically to meet the unique needs of metropolitan area school systems and other clientele in private industry and government.

Special curricula are tailored on an individual basis for liberal arts graduates and graduates of other professional schools who are interested in teaching or other human services areas. The School also offers a wide range of courses for teachers who wish to renew licenses and for provisional teachers who wish to prepare for teaching certificates.

Laboratory and clinical facilities are provided by the University Reading Center and the Counseling Laboratory. Field experiences are provided in cooperation with public and private schools, social and health agencies, museum institutions in the business community, and community and junior colleges.

The schedule of courses is arranged to meet the convenience of both full-time and part-time students.

### Education for Careers in Teaching

Programs of study for teaching careers are based upon the assumption that every teacher should have a broad general education, mastery of special studies related to the content of instruction, and professional knowledge and competencies.

The relative emphasis placed upon each of these aspects of the total education for teaching varies in accordance with the purposes of each program. For instance, since elementary school teachers teach all subjects, they require more preparation of greater breadth and less specialization than secondary school teachers.

It is the view of the School of Education and Human Development that the acceptable minimum education for teaching requires four years of full-time study or the equivalent in part-time study. For superior preparation teachers are urged to plan for five years of full-time study or the equivalent in part-time study.

The student may choose any one of the following plans to achieve superior educational preparation for teaching or for other education-related fields:

1. Upon receiving the bachelor's degree in education, he or she may take a teaching position and, after acquiring some professional experience, return to the



School for graduate study leading to the master's degree. During the first year of teaching, in particular, graduates are encouraged to establish a close contact with the School of Education and Human Development, whose faculty will provide supportive assistance to beginning teacher graduates of the school. This plan enables students with bachelor's degrees to begin their teaching careers and to use their work experience to enhance graduate study that will follow.

2. The student may choose to pursue full- or part-time graduate study leading to the master's degree immediately after receiving the bachelor's degree.

3. A student whose bachelor's degree is in one of the liberal arts disciplines may choose to complete the requirements for certification for teaching by studying in one of the teaching fields in a program tailored to his or her particular needs.

### **Education for Careers in Human Services and Human Development**

Programs of study for human service and human development careers are offered in the School of Education and Human Development. At the undergraduate level, these include programs in human services and in exercise and sport science. At the master's degree level, programs include adult education, community counseling, education policy studies, exercise science, human resource development, museum education, rehabilitation counseling, and tourism administration. Specialist programs are offered in adult education, counseling, human resource development, and special education. Doctoral programs are offered in human resource development and adult education, educational administration and policy studies, counseling, and human development.

At the undergraduate level, programs of study provide a strong liberal arts/general education component, specialty studies, professional studies, and supervised field experiences. Graduates are prepared to enter a specialty career field or continue with graduate studies. Master's degree programs offer advanced specialized studies in a selected field, and doctoral programs provide leadership, research, and advanced professional skills.

### **Professional Courses for Non-Education Majors (Teacher Certification)**

Columbian College students in a number of major fields are permitted to use their electives to complete up to 18 credit hours of professional education courses required for teaching in junior and senior high schools. Students may graduate with 120 semester hours or may choose to complete all courses required for teacher certification and graduate with a program in excess of 120 semester hours. Students interested in taking these courses should contact the office of the dean of the School of Education and Human Development for advising.

Freshmen and sophomore students may take professional education courses that include field work experiences. Some of these courses make it possible for students who are undecided about their choice of a career to have an opportunity to test teaching and some of the many related human service areas.

Many education courses are open to non-education majors. It is recommended that students check with the appropriate departmental office for more specific information on courses that are open.

The School of Education and Human Development offers secondary fields of study in early childhood education, exercise and sport, human services, secondary education (certification), special education, and tourism studies. Specific information is available in the brochure "Secondary Fields of Study" available in the office of the dean.



### Study Abroad Programs

Study abroad programs for the academic year are currently available in England, France, Germany, Japan, China, and Peru. Students who wish to study in countries not mentioned here should check with the office of the dean. Credits earned with acceptable grades are transferable toward the appropriate degree at George Washington University, provided there is no duplication of work done previously. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. Information may be obtained from the Study Abroad Office, Stuart Hall, Room 102.

Study abroad is available at varying locations during the summer. Information on summer programs abroad is available in the GWU Summer Session Announcement and through the Division of Continuing Education.

### REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulations.

### THE BACHELOR'S DEGREES

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development (elementary education, elementary education/early childhood education, special education, and human services) and Bachelor of Science in Human Kinetics and Leisure Studies (exercise and sport science).

### Entrance Requirements for Freshmen and Sophomores

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman and/or sophomore years are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units,\* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college-preparatory mathematics.
2. The principal's statement that the applicant is prepared to undertake college work.
3. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test, or on the American College Testing battery.

It is recommended that the College Board examinations be taken in December or January of the senior year. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, N.J. 08541-6200, not less than one month before the date of the tests. In applying for the tests, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions directly from

\* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.



the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The School of Education and Human Development will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not meet all of the formal requirements stated above. The School may require appropriate scholastic aptitude tests. Students admitted with deficiencies in secondary school units will be required to begin removing such deficiencies within the first year, by appropriate courses or examinations.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting such a certificate must also show competence in the English language and may be required to enroll in a full-time program in English as a Foreign Language before beginning studies in a degree program. Requirements will be determined on the basis of an English Proficiency Test administered on campus. A candidate who submits a score of 580 or above on the Test of English as a Foreign Language (TOEFL) may be excused from taking further course work in English as a Foreign Language but will be required to take the English Placement Examination on campus.

Students who have been out of secondary school for three years or more or do not meet the above requirements may take a special battery of admission tests by contacting the Office of Admissions or may be considered for provisional admission to the School of Education and Human Development. A student admitted provisionally is required to complete a trial program of 15 semester hours of course work with a quality-point index of 2.50 or higher. The selection of courses to be taken in the trial program must be made in conference with a faculty advisor.

All undergraduates admitted directly to the School of Education and Human Development are assigned academic advisors at the time of admission. Advisors are designated to provide continuity of advising for students throughout their years of undergraduate study. The program for each student must be approved by a faculty advisor.

Since each student's program is defined by individual needs, it is important that students have a clear concept of their major interest in education and the human services. In the case of teacher education students, they should be familiar with the certification requirements of those localities in which they expect to teach. Information on state licensing requirements is available in the Career Services Center, located in the Academic Center.

### **Admission With Advanced Standing**

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University are as follows.

Students who have accumulated 15 hours or more of academic credit at another regionally accredited college or university with an acceptable program and acceptable grades may be admitted to the School of Education and Human Development as transfer students with advanced standing. Such transfer students must have a quality-point index of 2.50 or better for college course work and must meet freshman requirements. Advanced standing may be awarded for properly certified courses for which the student received a grade of C or better, provided that such courses are comparable to the curriculum requirements of the degree at GWU. In the case of course work from a two-year college, no more than 60 to 63 semester hours of credit may be applied as advanced standing toward the total number of semester hours required for the bachelor's degree.



Although a grade of D in a course is not acceptable for transfer, the course may be used to satisfy a curriculum requirement. Credits earned with a D grade may not, however, be counted toward advanced standing.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University into a degree program in the School of Education and Human Development. The student must present an accumulated quality-point index of 2.50 or higher at the time of transfer and must submit a formal application of transfer to the Office of Admissions.

Students applying for transfer from another accredited college or university or from another division of this University, who do not meet the formal requirements for admission with advanced standing or whose previous academic records raise doubts of their ability to complete degree requirements successfully, may be provisionally admitted to the School of Education and Human Development. To be admitted into the School's degree program, a provisionally admitted student must complete a prescribed trial program of 15 semester hours of course work with a quality-point index of 2.50 or higher.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Education and Human Development. A conference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted a degree-candidate application will be advanced to degree status.

Nurses filing for admission to the bachelor's program in Human Services are required to submit a copy of their current state nurse's registration (license) in addition to the official transcripts. Nurses may be awarded advanced standing for work completed in a community or junior college program. They may also receive advanced standing of up to 45 credit hours for course work completed as part of a three-year nursing diploma program in a teaching hospital. Graduates of associate's degree nursing programs may be awarded advanced standing of up to 63 credit hours.

### **General Scholarship Requirements for Undergraduates**

Regulations regarding academic standing, probation, suspension, withdrawal, classification of students, required placement examinations, and waiving introductory courses by examination are the same as those for Columbian College; they appear on pages 68-69 and 72-73 of this *Bulletin*.

### **ACADEMIC WORK LOAD**

Fifteen to 17 semester hours of credit constitute a normal program. A student with a quality-point index of 3.00 or higher may, with the permission of the dean, enroll for 18 or 19 hours. No student may enroll for more than 19, except by permission of the dean.

The following work load regulations apply to both graduate and undergraduate students. Permission of the dean, in the circumstances outlined below, requires a request form that is to be filed in the office of the dean at the time of registration.

Students employed 15 hours or less a week may carry a normal program of college work.



Students employed from 16 to 25 hours a week may enroll for 12 or 13 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean, enroll for 15 or 16 hours.

Students employed from 26 to 34 hours a week may enroll for 9 or 10 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean, enroll for 12 or 13 hours.

Students employed 35 hours or more a week may enroll for 6 or 7 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean, enroll for 9 or 10 hours.

Students who increase their hours of employment after registration or at any time during a semester must report immediately to the dean so that their programs may be adjusted if necessary.

Graduate students employed full time may take a maximum of 6 semester hours, unless special permission to take more is granted by the dean.

#### REQUIRED PLACEMENT EXAMINATIONS

**English**—Students whose College Board English Composition Achievement Test scores suggest that they will benefit from more intensive training in compositional skills may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10.

**Foreign Languages**—A student who has not been granted advanced standing and wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

**Mathematics**—New students accepted for registration in Math 30 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 are required, prior to registration, to take a placement examination in algebra.

#### EARNING CREDIT BY EXAMINATION

Undergraduate students may earn credit up to a maximum of 30 hours by performing satisfactorily on College-Level Examination Program (CLEP) tests or special departmental examinations provided by the departments of Columbian College of Arts and Sciences on an individual basis. Passing a waiver examination does not entitle the student to any semester hours of credit in the School of Education and Human Development. A limited amount of credit may be assigned for selected service school instruction.

Students interested in becoming certified to teach who have earned bachelor's or graduate degrees in fields other than education may satisfy some certification requirements by taking the CLEP tests or special departmental examinations. See pages 21–22 for general information on the CLEP tests and for information on special examinations offered by departments.

#### Requirements for the Degrees

To be recommended for a degree, a student must satisfy the admission, residence, scholarship, and curriculum requirements. The amount of course work required for bachelor degrees is as follows:

**Bachelor of Arts in Education and Human Development**—elementary education, elementary education/early childhood education (double major), special education, and human services, 126 semester hours.



*Bachelor of Science in Human Kinetics and Leisure Studies*—exercise and sport science, 120 semester hours.

#### RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a minimum 30 semester hours in the School of Education and Human Development.

#### DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quality-point index of 3.5 on courses completed during the past semester. A part-time student to be eligible, must obtain a quality-point index of 3.5 on the last 12 semester hours of course work. Such part-time students must be in residence and must be continuously enrolled.

#### SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see page 46.

A quality-point index of at least 2.50 is required before permission is granted to do student teaching in the senior year. In order to graduate, a student must have a quality-point index of at least 2.25.

**Probation**—A student who fails to maintain a quality-point index of at least 2.25 is placed on probation. The student remains on probation as long as the index is below 2.25 or until probation is removed by the Student Committee.

**Suspension**—A student on probation who fails to raise the index to 2.25 within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, appeal the case through the dean to the Student Committee. If the case appears to be remediable and the student's scholarship seems likely to improve, the Committee may readmit the student on probation. A student denied readmission may again, after a lapse of a calendar year, petition the Committee through the dean for readmission. A student suspended twice will not be readmitted.

#### USE OF CORRECT ENGLISH

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

#### CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 60 semester hours must consist of courses numbered above 100 or the equivalent in transfer credits.

#### PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better may, with the approval of an advisor and the dean, take one course per semester and receive a grade of P (Pass) or NP (No Pass), which will be recorded on the student's transcript but will not be reflected in the student's quality-point index. No student will be allowed to take more than four pass/no pass courses. Students must sign up for such an option at registration. Students may change



from pass/no pass status to graded status, or vice versa, after the end of registration only with the permission of the dean and the course instructor. Courses required in the student's major field may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment at this University.

#### INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of I (Incomplete) or W (Authorized Withdrawal) may be assigned are described under Regulations.

**Changing an Incomplete**—When a grade of I is assigned, the instructor should normally set a period within which the uncompleted work (usually the final examination or a required paper) must be made up. When required work has been completed, it is the responsibility of the instructor to change the grade of I as appropriate. If work is not completed, the instructor will decide whether to change the grade of I to F or to allow the I grade to remain. The grade of I cannot be changed by reregistering for the course here or by taking its equivalent elsewhere.

#### NATIONAL TEACHER EXAMINATION

The National Teacher Examination is required for teacher education majors. Students who take the Examination receive individual reports of test scores and may avail themselves of the regular transcript services of the Educational Testing Service.

#### Bachelor of Arts in Education and Human Development Teacher Education Programs

Teacher education programs leading to the degree of Bachelor of Arts in Education and Human Development (elementary education, elementary education/early childhood education, and special education) are planned to provide (1) a general education component, (2) a strong academic background relevant to one or more teaching fields, (3) a mastery of professional knowledge and skills necessary for the beginning teacher, and (4) development of attitudes needed for success in teaching.

#### GENERAL EDUCATION

The general education component is an integrated course of study that provides teacher education students appropriate depth and breadth in the liberal arts and sciences. The general education component provides theoretical and practical knowledge gained from studies in languages, mathematics, sciences, history, philosophy, literature, and the arts.

The following is the general education curriculum for the Bachelor of Arts in Education and Human Development degree with major fields in elementary education, elementary education/childhood education, and special education. Certain introductory general education courses may be waived according to regulations explained elsewhere in this *Bulletin*, and higher-level courses may be substituted in the same field. Students should consult their advisors regarding waiving and substituting courses. Waiving a course does not allow a reduction in semester-hour requirements.

The following courses are required. Engl 9 or 10, 11 or 12, and 51-52 or 171-72; Math 9 and 10; 6 credit hours in biological science and 3 in physical science or vice versa; 9 credit hours of social science courses; SpHr 11; and (for students in elementary education and special education only) HmKn 122.



## PREPROFESSIONAL STUDIES

Preprofessional studies consist of introductory education and human development courses that students take in their freshman and sophomore years. The studies introduce students to the broad field of education, provide basic knowledge about human development, and afford initial field experiences in educational and human development settings.

Preprofessional course requirements for elementary education and early childhood/elementary education are TrEd 50, Educ 171 and 172. Preprofessional course requirements for special education are Educ 171; SpEd 57, 58; and TrEd 105.

## SPECIALTY STUDIES

The specialty studies provide teacher education students with a mastery of the structure, skills, concepts, ideas, values, and facts that constitute their field of specialization. It encompasses both concentrated study and knowledge of the methods of inquiry appropriate to the specialty area.

The content of a student's specialty studies depends upon the teaching position for which the student is preparing. The student may begin specialty studies during the first two years.

## PROFESSIONAL EDUCATION

The basic professional information, skills, and attitudes needed by beginning teachers are provided through a sequence of courses to be taken throughout the four years of undergraduate study. Lectures and class discussions are closely coordinated with field work. The prescribed courses in special methods are concerned primarily with methods of initiating, guiding, and evaluating learning experiences dealing with the content of teaching fields. They attempt to bring the student specific suggestions drawn from the accumulated experience of successful teachers. In addition, the courses review the teaching-field content currently in use in schools.

Second-semester sophomore students in teacher preparation programs must file an application for permission to complete the professional studies component in the junior and senior years. Applications may be obtained in the Office of the Dean or the Office of Laboratory Experiences. Academic advisors must recommend students for the professional studies component. A writing sample is required.

Students with an education major must be approved for student teaching prior to the eighth semester by their academic advisors. A grade-point average of 2.5 is required as well as a valid medical certificate indicating that the student has taken a T.B. test and is free of tuberculosis.

The teacher education programs and their requirements are as follows.

**Elementary Education Program**

GENERAL EDUCATION REQUIREMENTS (See General Education curriculum, above.)

PREPROFESSIONAL STUDIES (See Preprofessional Studies, above.)

## SPECIALTY STUDIES

The required courses are HmKn 122 and 3 semester hours each of U.S. history, geography, economics, art history, and music history.



**PROFESSIONAL COURSES**

The required courses are Educ 104, 112, 180; TrEd 105, 110, 111, 128, 135.

**Special Education Program**

GENERAL EDUCATION REQUIREMENTS (See General Education curriculum, above.)

PREPROFESSIONAL STUDIES (See Preprofessional Studies, above.)

**SPECIALTY STUDIES**

Same as the elementary education program above, plus Psyc 101.

**PROFESSIONAL COURSES**

The required courses are SpEd 102, 189, 170, 103, 190, 101, 199, 160, 168; Educ 112, 180; TrEd 110, 118, 128.

**Elementary Education/Early Childhood Education Program**

Early childhood education can be selected as a second major in conjunction with the elementary education major. The preprofessional studies, general education, specialty studies, and professional courses are the same as those required for elementary education. In addition, students are required to complete TrEd 132, 150, 152, 153, and 154.

**Bachelor of Arts in Education and Human Development  
Human Services Program**

The Human Services Program is designed for persons who are employed or wish to work in the following representative types of human service areas: hospitals and health care agencies, residential centers, cultural institutions, substance abuse rehabilitation programs, correctional institutions, and voluntary agencies.

The program includes a core of course work in the human services, fieldwork experiences in diverse human services settings, and academic concentration in selected academic departments of the University. Each program is individually planned after evaluation of the student's professional and educational background and long-range goals.

Students planning to major in human services take the following courses: Engl 9 or 10, 11 or 12, 51-52; Comm 1, 121; one course chosen from Math 9, 10, or 12 or Stat 51 or 53; BiSc 3-4 or an alternative approved science sequence; 27 credit hours of courses in the social sciences that have been approved by the advisor, including a course in professional ethics and at least 6 hours of history or political science and 9 hours of anthropology and/or sociology; 9 hours of electives. The core program consists of 39 credit hours, including TrEd 50, 105; Educ 171, 172, 104; HmSr 176, 182, 195; SLP 152; and 9 additional hours in the core program selected with approval of the advisor. The concentration consists of 24 credit hours and is selected from the following fields: early childhood education, rehabilitation services, special education, adult education, health services administration, and human resource development. In addition, students may select a minor in rehabilitation services, consisting of five core courses and a subspecialty in developmental disabilities, client advocacy, or psychosocial disabilities.



### **Bachelor of Science in Human Kinetics and Leisure Studies Exercise and Sport Science**

Students who plan to major in exercise and sport science take the following courses in the first two years of study: Engl 9 or 10 and 11 or 12; four courses selected from American civilization, anthropology, economics, geography, history, political science, psychology, or sociology; two courses selected from BiSc 3-4, Chem 3-4, Geol 1-2, Math 9-10, or Phys 1-2 or 9-10; HmKn 103, 111-12, 129, 130, 150, 151, 158, and four ExSA or HmKn courses totaling a minimum of 9 credits and selected with the approval of the advisor; 3 credit hours of electives. In the third and fourth years, the following courses are taken: Engl 51-52 or 71-72; Comm 1 or 111 or SpHr 11; ExSA 100; HmKn 134, 138, 139, 140, 152, 159, 161-62, 171, and two additional courses selected with approval of the advisor. 27 credit hours of elective courses approved by the advisor.

### **GRADUATE STUDY**

The School of Education and Human Development offers graduate programs leading to the degrees of Master of Arts in Teaching, Master of Education, Master of Arts in Education and Human Development, Education Specialist, and Doctor of Education.

#### **Grades**

For graduate work, grades are indicated as A, Excellent; B, Good; C, Minimum Pass; F, Fail; I, Incomplete; IP, Progress; W, Authorized Withdrawal; Z, Unauthorized Withdrawal; CR, Credit. Grades A, B, C, and F are counted in computing the quality-point index (see page 46).

Whenever a grade has not been assigned, the symbols I (Incomplete) or the W (Authorized Withdrawal) will be recorded. The I indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. An instructor recording a grade of I will normally stipulate a date by which work must be completed. The instructor has the responsibility for changing the grade of I to an appropriate grade upon completion of work or, if work is not completed by the stipulated date, determining whether the grade of I should be changed to F or allowed to remain in the record.

#### **Use of Correct English**

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

Regulations governing English language tests and courses for all international students who are graduate degree candidates are listed under The Degree of Doctor of Education.

### **THE DEGREE OF MASTER OF ARTS IN TEACHING IN THE FIELD OF MUSEUM EDUCATION**

The School of Education and Human Development offers an intensive interdisciplinary program in museum education. The program is designed to prepare selected graduates, postgraduates, and professionals for work in art, history, science museums; zoos, aquaria, or nature centers; and historical societies or



sites. Graduates qualify to serve as liaison persons between schools and museums and as professionals in museum-related private and public agencies.

### Admission

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work experience; and (3) be interviewed by the Selection Committee or make alternative arrangements specified by the Committee. Skills in communication, a desire to study and learn from museum collections, and an ability to work with people are essential. Evidence of strong undergraduate, graduate, or professional experience in such fields as American studies, anthropology, art history, fine arts, or the biological or physical sciences is desirable.

### Plan of Study

All degree candidates take five sequential core courses in three successive semesters beginning in June and ending in April of the following year. Each student also pursues four elective courses in a chosen museum-related academic discipline. Two carefully supervised field placements provide direct museum education experience. In the fall semester, students serve two days a week as museum resource consultants to schools or alternative educational sites. In the spring semester, students hold four-day-a-week internships in a museum or museum-related organization. For details, write the Museum Education Program, George Washington University, 2201 G St., N.W., Washington, D.C. 20052.

## THE DEGREE OF MASTER OF EDUCATION

**Elementary Education**—The Master of Education in the field of elementary education is designed for those with an undergraduate degree in a major other than education. The minimum 45-semester-hour program includes course work for students who wish to become eligible for certification for teaching at the elementary school level; additional course work in content areas may be needed to meet specific jurisdictional requirements for certification.

**Secondary Education**—The Master of Education in the field of secondary education is designed for those with an undergraduate degree in a major (or with substantial course work) in a field taught in secondary schools. The 36-semester-hour program provides eligibility for teacher certification and includes 24 hours of required courses in education theory and pedagogy and 12 hours that may be in either education or the subject area intended to be taught.

## THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

The degree programs leading to the Master of Arts in Education and Human Development are designed to provide students with specialized knowledge and skills required for advanced professional competence in a variety of educational, human development, human service, and service industry careers. Each program of study involves a combination of classroom and field-based learning experiences tailored to a professional specialty and individual student needs. Students engage in a wide range of teaching and research approaches that reflect the School's commitment to excellence in professional education.

The diversity of master's programs in the School of Education and Human Development reflects its belief that education and human development comprise



a multifaceted enterprise reaching persons of all ages in a variety of settings. These programs develop professional knowledge, skills, and attitudes that will enable graduates to foster human learning, growth, and development in individuals throughout society. Depending on the program specialty, students are prepared to pursue careers in schools, universities, community-based and human service organizations, cultural and leisure institutions, and business and government settings.

Master's programs are available in the fields listed on the following pages.

### **Administration of College Student Development Services**

The focus of this program is on the development of broad-based administrative and management skills adapted for use in programs and services that foster college student development. The program provides preparation in administration, counseling, group facilitation, leadership training, and organizational development.

This 39-semester-hour program includes courses in foundations of college student development, college students and their communities, group theories and techniques, higher education in the United States, and foundations of counseling and human development. The program also includes supervised experience, practicum, and seminars as deemed appropriate.

### **Adult Education**

This program is planned for those planning careers as learning specialists, administrators, counselors, and consultants in the field of adult education. In addition to persons with academic training in education, individuals with expertise in many other fields can combine their knowledge in a specific field with graduate training in adult education and thereby begin a career transition into adult education.

The 39-semester-hour program includes courses in adult education, program planning in adult education, adult learning, and current issues in adult learning programs. The program includes 15 semester hours of elective courses, which the student plans in consultation with a faculty advisor. This portion of the program offers an opportunity to select courses especially suited to individual career interests.

### **Counseling**

The master's programs in counseling are designed to provide three specialty concentrations and one subspecialty concentration for entry-level positions in professional counseling. Program graduates are prepared to specialize in a specific field and to work in a variety of settings in which professional counseling is offered. All counseling concentrations require the equivalent of two full years of study and provide core learning experiences that combine professional and behavioral studies with supervised laboratory, practicum, and internship experiences. Some programs have specific prerequisites in addition to the general admissions requirements. The programs are accredited by the Council for the Accreditation of Counseling and Related Educational Programs and the Council on Rehabilitation Education.

The core course of studies for all program concentrations includes course work in the foundations of counseling, human behavior and development, mental health problems, testing and appraisal, career development, individual and group counseling, cross-cultural counseling, and research and statistics.



### **Community Counseling**

This is a 48-semester-hour program. Candidates who complete the program are prepared to enter the counseling profession in a variety of human service settings, including welfare and other social service agencies, penal institutions, court systems, employment centers, allied health agencies, government service agencies, community college counseling centers, employee assistance programs, and private practice.

### **School Counseling**

This 48-semester-hour program provides professional preparation for individuals to become certified as counselors in public and private schools. The program is designed to provide students with the requisite knowledge and skills to provide professional counseling, assessment, consultation, and guidance services in a school setting.

### **Rehabilitation Counseling**

This 51-semester-hour program prepares rehabilitation counselors to assist persons who are physically, mentally, emotionally, or socially disabled to assume or resume their place in society. The rehabilitation counselor works with the client in developing a rehabilitation plan to assist in such areas as independent living, job placement, overcoming substance abuse, and physical, social, or developmental disabilities that may prevent the individual from leading a normal life.

### **Employee Assistance Counseling**

This subspecialty can be elected as part of either the community counseling or rehabilitation counseling programs. The subspecialty is designed to prepare graduates as professional counselors in employee assistance programs in business, industry, and government settings.

### **Curriculum and Instruction**

This program is designed to prepare teachers and other educational personnel for increased responsibilities in the planning, implementation, and evaluation of curriculum and instruction.

The 33-semester-hour program includes study in curriculum development, research and evaluation of instructional practice, teacher education, work with special populations, and school policy and management. A program specialization may include advanced study in elementary education, a content area of secondary education, English as a second language, education of the gifted and talented, reading, or special education. A practicum is required.

### **Education Policy Studies**

The program in education policy studies is designed for students who wish to develop skills in the technical, political, and managerial aspects of education policy analysis. Emphasis is placed on developing both a broad understanding of the political and social environment in which education policy is formulated and the technical competence to undertake independent analysis of a policy initiative. Internships are offered in a variety of federal, state, and local agencies.

The 36-semester-hour program includes course work in the policy-making process, planning, evaluation, and current social policies influencing education. At least 9 hours of electives must be taken in a field of specialization. The student may elect to write a thesis in place of 3 semester hours of course work.



**Educational Technology Leadership**

This program is designed for persons who are entering or advancing in positions associated with schools, higher education, alternative educational settings, or other human service occupations in which computers and related information delivery technologies are used. The program of studies provides students with opportunities to develop the knowledge, understanding, and skills necessary to provide leadership in the rapidly changing environment of technology use in education.

The 36-hour program includes required course work in the theory and practice of educational technology, including the use of computers and other instructional technology systems, technological management systems, policy-making research methods, and leadership. Twelve hours of the program are specialization electives, which can be chosen, with the advisor's consent, from other departments in the University. Students may elect to complete a thesis for elective credit with the prior consent of the advisor.

**Elementary/Secondary Administration**

This program provides the entry-level professional with preparation for certification in leadership positions, such as principal, assistant principal, and department head in elementary and secondary schools. Candidates must have a minimum of two years of successful teaching experience.

The 33-semester-hour program includes courses in fundamentals of educational administration, foundations of curriculum development, supervision of instruction, the K-12 principalship, supervision in the elementary and secondary schools, school business management, human relations in educational management, and school law. Course requirements are intended to be flexible and can be tailored, with the approval of a faculty advisor, to accord with the needs and established competencies of individual students.

**Exercise Science**

This program is designed to develop competencies to assess physical fitness; prescribe therapeutic activities; conduct exercise programs; evaluate program effectiveness; identify sports injuries, EKG abnormalities, and anxiety factors related to fitness; and apply principles of exercise physiology and kinesiology to physical conditioning and performance.

The 36-semester-hour program includes courses in motor learning and performance, advanced concepts in motor development, fitness evaluation and exercise prescription, sports medicine, principles and concepts of employee health fitness programs, and exercise, stress, and cardiac rehabilitation. Practicum opportunities on campus are available in the University's Runner's Clinic, Cardiac Rehabilitation Exercise Program, and the Stress Testing and Exercise Prescription Program. A variety of off-campus practicum sites are also available.

**Higher Education**

This program is designed so that a student may select a concentration in administration, teaching, or curriculum. The program helps to prepare students for administrative positions in academic affairs, public relations, finance, and development in colleges and universities. The course of studies offers an intensive review of the history, scope, present status, and trends of higher education in the United States in comparison to selected systems of higher education in other parts of the world. Students gain knowledge and skills related to the governance, organization, and administration of colleges and universities.



The 39-semester-hour program includes courses on higher education in the United States, administration of higher education, and the community/junior college. An internship is required.

### **Human Resource Development**

This program is designed for persons entering or advancing in positions associated with training, education, and development activities, in business, industry, government, and other large organizations in the public or private sector. The program is interdisciplinary, and students are encouraged to tailor their programs to individual career needs and objectives.

The four required courses in the 39-semester-hour program include training and education in human resource development, design of training programs, consultant-client relationships, and current issues in adult learning programs. Field work in cooperating Washington-area business, industry, government, and community organizations may be a part of the learning experience.

### **Individualized Master's in Education and Human Development**

This program provides the opportunity to develop an individualized curriculum that cuts across existing fields, both within the School of Education and Human Development and between the School and other schools and departments of the University and the Consortium. The program is designed to meet specific, identified career and professional objectives of applicants who have unique needs. The flexible program structure can be tailored to prepare for new and emerging fields in education and human development.

This program of 36 semester hours is available within or across the four departments of the School of Education and Human Development. The program must contain a 12-semester-hour core curriculum consisting of courses in human development, social/historical/philosophical foundations in education, and curriculum. The remaining 24 semester hours must correspond directly to the program objectives and bear a direct relationship to each of the areas identified above. A minimum of 6 semester hours of fieldwork, or the equivalent, must be a part of the program.

### **Individualized Master's in Human Kinetics and Leisure Studies**

This program is designed to permit students to pursue a course of studies to meet unique professional goals for special areas and fields in human kinetics and leisure studies. The program allows students the opportunity for a course of studies that cuts across program offerings either within the department or across departments. A set of program objectives is specified for each individual, based on the background and professional goals of the student and related to the overall objectives of the School.

This is a 36-semester-hour program, with specific course work determined in consultation by the advisor and student. Total semester hours may be more than 36 if additional courses are needed to meet the student's stated objectives. A practicum and oral comprehensive examination are required.

### **International Education**

This program is designed for persons who are entering or advancing in positions associated with training, education, adult learning, and development activities in diverse settings that require international understanding. The program provides knowledge of other countries and cultures, using the education system as a means of interpreting and translating knowledge across cultures and analysis of



the formal and nonformal school systems as they reflect history, culture, development, values, contemporary concerns, and future trends.

The 33-semester-hour program allows a selection from a variety of subspecialization areas. Four courses are chosen from international education, comparative education, selected topics in international education, international experiences, and futurism. The 9-semester-hour subspecialty complements the major area of study and may be taken in any division of the University. A comprehensive examination is required.

#### **Reading Progress Management: Classroom and Clinic**

This program is planned to prepare reading education professionals as special teachers, clinicians, consultants, and supervisors. The program develops competencies in the foundations of reading instruction, classroom and individual diagnosis and treatment, and specialized knowledge areas reflecting the student's career interests. This enables students to meet the professional standards for reading specialists as specified by the International Reading Association. Theory and practice are carefully integrated in classroom courses and in practicums that are school-based or in the Reading Center, a multidisciplinary clinical center located in the School of Education and Human Development.

The 33-semester-hour program includes courses in foundations of reading development, diagnostic teaching of reading (K-6), clinical study of reading problems, and assessment of cognitive functioning. Depending on a student's career interests, courses are taken in reading in the content areas at the secondary level, cognitive models and instruction, the organization and administration of reading programs, or severe learning disabilities in reading.

#### **Special Education**

The four master's programs in special education provide core and specialty studies and field experiences designed to prepare highly competent and committed professionals for a broad range of educational and leadership roles in the field of special education and related services.

##### **Early Childhood Special Education**

This program is designed to prepare educators with insight and knowledge in the areas of the development of young exceptional children, handicapping conditions, identification and assessment procedures, and clinical teaching and alternative models of service for developmentally delayed young children. The program prepares teachers of developmentally delayed young children (a direct service role) and early childhood special education strategists (a consultative role).

The 39-semester-hour program includes courses in language development, typical and atypical development, developmental and formal assessment, multidisciplinary theory, professional roles, family intervention skills, behavior management, and legal policy concerns. A seminar, practicum, and internship are required.

##### **Early Intervention**

This program is designed to prepare professionals to serve the needs of developmentally delayed and at-risk infants and toddlers and their families. The course of study prepares students to perform direct service, administrative, consultative, and research roles in health care, human services, and educational settings.



Internships in specialization areas include hospital-based programs, infant intervention settings, developmental assessment clinics, research facilities, day-care centers, and advocacy organizations.

The 39-semester-hour program includes courses in medical and genetic issues, infant development and assessment, neurodevelopmental programming, technology, family systems intervention, case-management approaches, and interdisciplinary team functioning. A seminar, practicum, and internship are required.

#### **Special Education for Seriously Emotionally Disturbed Adolescents**

This program prepares special educators to work as members of multidisciplinary teams in residential sites, extended day care centers, and schools that serve seriously emotionally disturbed adolescents. Participants develop professional skills to assess problems, plan teaching strategies, create a therapeutic milieu, tap multiagency resources, counsel students and their families, and build realistic learning and living expectations.

The 39-semester-hour program includes courses in developmental assessment of adolescents, psychoeducational characteristics of the seriously emotionally disturbed adolescent, specialized curriculum methods and intervention strategies, and interdisciplinary theory and planning approaches. Students are required to participate in an internship and in course work or clinical experiences in the Psychiatry and Behavioral Sciences and Psychology Departments.

#### **Transitional Special Education**

This program is designed to train those who help youth and adults with special needs to make the transition from school to independent living and employment. The program requires at least 39 semester hours of graduate course work and field experience, although the total number of hours will vary depending on the certification options selected by the student. The following areas of specialization are offered: secondary and vocational programming, collaborative vocational evaluation, corrections, school-based vocational evaluation, learning disabilities, and community living and supportive work.

#### **Supervision and Human Relations**

This program is designed primarily to prepare teachers and other educational personnel for increased responsibility in teaching and for administrative and supervisory positions. The program offerings lead toward certification for administrative and supervisory positions in most school jurisdictions. Basic courses relate to general supervisory principles and responsibilities and are also of interest to educators in non-school educational and human service agencies.

The 33-semester-hour program includes courses in the foundations of curriculum development, human relations in educational management, supervision of instruction, and supervision in the elementary and secondary school. Appropriate elective courses, selected with the approval of a faculty advisor, allow students to increase knowledge and skills in teaching content areas and in other humanistic and behavioral disciplines related to education and supervision.

#### **Tourism Administration**

This program is designed to prepare persons to enter and advance in a professional career in travel and tourism. An internationally oriented program, it is concerned with the professional and research aspects of travel and tourism. The



program enables the student to develop competencies needed for a career in the travel and tourism field, with possible specialization in marketing and sales management administration; data processing and quantitative skills; communications and public relations; public policy and administration; historic, cultural, and national resource development; and travel industry operations.

At least 36 semester hours are required, including a thesis and a comprehensive examination. In addition to 12 semester hours from one or two tourism component concentrations, the required courses cover tourism development, planning for tourism, and economic, social, cultural, and ecological aspects of tourism. A 39-semester-hour nonthesis program is available; the comprehensive examination may be waived.

#### ENTRANCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

The School of Education and Human Development seeks applicants with strong academic potential, high motivation, and aptitude to do graduate-level work. Admission decisions are based on an evaluation of all material submitted in support of the application. The School requires official transcripts of all previous undergraduate and graduate course work and acceptable test scores on either the Graduate Record Examination or the Miller Analogies Test.

An interview in the office of the dean is required for applicants who live in the Washington, D.C., metropolitan area; a letter of reference is required of all other applicants.

In addition to these basic requirements, individual programs may require personal interviews, relevant professional experience, and other supporting documentation before a final decision on admission is made. Upon receipt of the application to the individual School program, information on specific requirements will be sent to the applicant. The personal interview, professional experience, and supporting references provide important qualitative evidence concerning an applicant's academic potential and professional background.

The admission review is based upon a comparison of qualifications among those who apply, weighing both the School's general admissions criteria and program-specific criteria.

Positive decisions are made quickly for applicants who present uniformly strong application credentials in all areas. In some cases, unusually strong factors will offset comparatively weak factors and result in an offer of admission to provisional status in the School. For a student to be admitted to full candidacy from provisional status, he or she must earn grades of B or better in a minimum of 9 semester hours of course work.

#### ADVANCED STANDING

Advanced standing is granted for approved courses taken at other accredited institutions, but a minimum of 24 semester hours must be completed at the University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in the University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's planned specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.



## PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education and Human Development requires a minimum of 33 hours of graduate credit. Several programs have additional credit hour requirements. The plan may, at the student's option, include a thesis carrying six hours of graduate credit. Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). A minimum of 12 hours, not including the thesis, must be from courses offered by the School of Education and Human Development.

Programs are planned initially in conference with an admission advisor in the School of Education and Human Development and subsequently with a designated advisor in the candidate's area of specialization. Programs are based on a candidate's interests and background; those related to teaching in public schools are designed around certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

## RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence.

## SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of C in more than six semester hours are subject to suspension. Students who receive a grade of F must confer with the dean before enrollment for further work.

## THE THESIS

Students may elect a thesis option. The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School's standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

## MASTER'S COMPREHENSIVE EXAMINATION

Candidates in master's programs requiring 33 semester hours may, with the approval of the academic advisor, elect to take an additional three-semester-hour course in lieu of a comprehensive examination. Candidates in programs whose basic requirements exceed 36 semester hours may waive the comprehensive examination with approval of the academic advisor. Candidates who plan to take the examination must be registered in the semester it is to be taken and must file a written application in the office of the School of Education and Human Development no later than 30 days prior to the date of the examination. Comprehensive



examinations are required of students in Administration of College Student Development Services, Elementary/Secondary Administration, Supervision and Human Relations, and all programs in Human Kinetics and Leisure Studies and in Teacher Preparation and Special Education.

#### WORK IN OTHER ACADEMIC DEPARTMENTS

For teachers interested in developing or strengthening their academic competence, the master's program in Curriculum and Instruction encourages 12 to 15 semester hours of work in departments other than education. The program is designed to meet the need of in-service teachers for additional work in a content area to qualify for advanced certification or to improve classroom skills and may also be helpful to previously trained teachers planning to re-enter the profession. The major emphasis is upon strengthening both academic and professional competencies.

#### SECOND MASTER'S DEGREE

Persons seeking a second master's degree in the School of Education and Human Development must complete all core and specialization requirements and a minimum residency requirement of 24 semester hours.

#### THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Specialist is for students with master's degrees in education who seek further professional preparation for specific objectives.

The program is under the supervision of the Advanced Graduate Faculty and is available in the fields of administration, adult education, counseling, curriculum and instruction, higher education, human resource development, and special education.

#### Admissions Requirements

The following are required for entrance to an Education Specialist program: Master of Arts in Education and Human Development or its equivalent, two years of pertinent experience in an education or human development field, and a graduate scholastic average of at least 3.3 and an acceptable score on either the Graduate Record Examination or Miller Analogies Test. Two letters of recommendation, one from a professional supervisor and one from the most recent graduate faculty advisor, are required, along with a statement of professional goals. Each applicant must be interviewed and recommended by a faculty advisor in the major field.

#### Scholarship

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education and Human Development (see above).

#### Programs of Study and Degree Requirements

Individual programs are developed, through a plan of study worked out with a faculty advisor, to fit the candidate's skills, interests, and career goals. A minimum of 30 semester hours beyond the requirements of the degree of Master of Arts in Education and Human Development is required. At least 21 hours of the



work must be taken in residence at GWU. A maximum of five calendar years is allowed for completion of the program.

At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, and (3) an area of specialization. A graduate-level research methods course must be included in the program if it was not completed in previous graduate work.

### **The Comprehensive Examination**

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

### **THE DEGREE OF DOCTOR OF EDUCATION**

The School of Education and Human Development offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in curriculum and instruction, special education, counseling and human development, educational administration and policy studies, human resource development and adult education, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counseling, curriculum, elementary education, higher education, human development, human resource development, international education, program evaluation, reading, secondary education, special education, supervision, teacher education, and tourism development and travel administration. With the approval of a student's program planning committee, course work may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

All doctoral programs are designed to accommodate the needs of working professionals who must pursue their studies on a part-time basis. Required graduate courses, with few exceptions, are offered in the late afternoon and evening. In some programs, selected courses may be taken at off-campus locations.

### **Admission**

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective and comparable to that required for the degree of Master of Arts in Education and Human Development at this University. Students with a master's degree in a field other than education may be considered for doctoral study provided that the degree and previous experience are judged relevant by the major field program faculty.

For an application to be forwarded to the major field program faculty for their consideration, an applicant must have a minimum graduate scholastic average of 3.3 and a 50th percentile score on the Miller Analogies Test or Graduate Record Examination. Under certain circumstances, the associate dean may recommend to the faculty a student who does not meet the stated criteria but who has shown exceptional promise in the chosen field. Programs often set higher admission standards, and the number of spaces available for new doctoral students limits the number that can be accepted.

The applicant is strongly encouraged to schedule an interview with the coordinator of doctoral programs or the Associate Dean, who will discuss the applicant's needs in relation to the School's resources, explain the required pro-



cedures and standards, and guide the applicant through the admission process. In addition, all applicants must have an interview with faculty members in the major field. Students receiving favorable recommendations from the major field faculty are admitted to precandidacy for the degree.

**International Students**—Students whose native language is not English and who have not earned a bachelor's or master's degree from a regionally accredited college or university in the United States are required to take the Test of English as a Foreign Language (TOEFL). A minimum TOEFL score of 550 is required for consideration for admission.

Admitted students whose TOEFL scores range between 550 and 600 will be required to take the University's English as a Foreign Language placement test prior to their first registration. Depending on the results of this test and subsequent class performance, the student's first-year academic program may be restricted in the number and type of courses that can be taken. Students assigned English as a Foreign Language (EFL) courses should anticipate additional related tuition expenses as well as a possible extended period of time required to complete their degree program.

For those students required to take EFL courses, the School's minimum English language proficiency requirement is considered to be satisfied either by (a) successful completion of EFL 50 (English Composition/Research Methods for International Students) with a minimum grade of B; or (b) an evaluation by the Director of English for International Students indicating that the student has achieved comparable proficiency status.

#### PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. Full-time students must complete this work within the first 18 semester hours; part-time students must complete it within three semesters of admission to precandidacy. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

#### Plan of Study

In general, from two to three years of full-time study beyond the master's degree in education, or the equivalent in part-time study, are required. Programs are individually planned.

Each program is divided into two parts. The first consists of studies preparatory to taking major and supporting field comprehensive examinations and required research tool studies. The second consists of the doctoral dissertation and the final oral examination.

Upon admission to doctoral candidacy, the student is assigned to a program planning committee of three faculty members, one of whom must be from outside the major field of study. Students who have completed the comprehensive examinations must register for a minimum of 6 semester hours of Dissertation Research per semester until 12 hours have been completed and a minimum of 3 semester hours per semester thereafter, to a total of 24 semester hours, until the satisfactory completion of the final oral examination.



### COMPREHENSIVE EXAMINATIONS

After successful completion of a minimum of 9 semester hours of course work, the student must pass a three-hour qualifying examination, the content of which includes questions from both the major field of study and foundations of education. Supporting field examinations are three-hour written examinations; if required, they are taken before the integrative comprehensive examination. All course work, including the research tool requirement, must be successfully completed prior to taking the integrative comprehensive examination (the only exception is the Pre-Dissertation Seminar). The integrative comprehensive examination is a written 12-hour examination, six hours on each of two successive days. The candidate begins the second part of the program after the satisfactory completion of all examinations and the required research tool field.

### THE DISSERTATION

A dissertation is required as evidence of ability to perform original scholarly research and to interpret and present its results.

At the beginning of the dissertation phase, the dean appoints a dissertation committee, consisting of a chairperson (usually a major field advisor) and two additional faculty members. The candidate is required to submit a proposal for the dissertation to this committee, which determines its acceptability. The dissertation is completed under the guidance of the chairperson, with the advice of the other members of the dissertation committee.

No later than the date specified in the calendar, the candidate must submit to the dean three complete copies of the dissertation and two copies of an abstract and biographical sketch for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in the office of the dean. The successful candidate for the doctorate is required, before receiving the degree, to pay fees that are applied toward the expense of binding library copies of the dissertation, printing the Announcement of the Final Examination, and the basic service rendered by University Microfilms, Inc., and to sign a microfilm agreement.

### THE FINAL EXAMINATION

When the dissertation has approval of the dissertation chairman and at least one other committee member, the candidate is recommended to the dean for the final oral examination, which must be passed at least 30 days before the degree is to be conferred. The examination is open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education and Human Development. Three final edited copies of the dissertation must be submitted to the office of the dean within one month of the final oral examination and no later than one month before the degree is to be conferred.

### Continuous Study and Residence

Students must be continuously enrolled in the School of Education and Human Development, unless the dean or the Advanced Graduate Faculty grants a leave of absence. Failure to register each semester of the academic year may result in



lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

All required examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for intensive study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

### **SPECIAL PROGRAMS AND SERVICES**

#### **Teacher Certification Curricula**

The School of Education and Human Development provides individualized planned programs for liberal arts graduates with appropriate degrees from accredited institutions who wish to prepare for teaching. Those seeking certification, but not wishing to work for a degree, may enroll in a certification program if they meet the admission, scholarship, and personality requirements of degree candidates. The School also provides a wide range of courses of interest to teachers who wish to renew licenses.

**Reading Center** (See page 53)

#### **Off-Campus Degree Programs**

The School of Education and Human Development offers off-campus programs leading to the Master of Arts in Education and Human Development in the fields of adult education, curriculum and instruction, higher education, human resource development, early childhood special education, transitional special education, and supervision and human relations; and the Education Specialist in the fields of administration and higher education. The programs are administered through the Division of Continuing Education.

### **SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION**

Acting Dean B. Burdetsky

Acting Associate Dean M.M. Harmon

Assistant Deans M.S. Katzman, P.B. Malone III

#### **FACULTY 1988-89**

Professors W.C. Adams, F. Amling, H.G. Askari, T.M. Barnhill, W.H. Becker, P. Birnbaum, B. Burdetsky, J.H. Carson, B.L. Catron, S.R. Chitwood, K.J. Darr, H. Davis, S.F. Divita, R.F. Dyer, A. El-Ansary, R.W. Eldridge, M.H. Firestone, E. Forman, J.D. Frame, S.S. Fuller, D.E. Gale, M.G. Gallagher, F. Ghadar, S. Gree, P.D. Grub, W.E. Halal, A.E. Hammad (Visiting), M.M. Harmon, J. Harvey, Hilmy, G. Honadle (Visiting), F.C. Kurtz, G.P. Lauter, J. Lobuts, Jr., N.M. Loes, A.J. Mastro, D.C. McGrath, Jr., K.E. Newcomer, J.E. Ott, C.M. Paik, Y.S. Pa



L.G. Pawlson, P.N. Reeves, R.K. Riegelman, W.E. Seale (*Distinguished Visiting*), F.W. Segel, M.J. Shaffer, S.N. Sherman, R.G. Shouldice, W. Sommers (*Emeritus*), R.McK.F. Southby, S.J. Tolchin, S.J. Trachtenberg, S. Umpleby, P.B. Vaill, L.S. Vansina (*Visiting*), C.W. Washington, E.K. Winslow

Associate Professors J.M. Cary, N.G. Cohen, J.W. Cook (*Visiting*), J.P. Coyne, G.E. Crum, R.G. Donnelly, S.R. Eastaugh, L. Graff, W. Greenberg, W.W. Hardgrave, R.L. Holland, D.L. Infeld, J.F. Kasle, M.S. Katzman, J.E. Kee, D.J. Lenn, J. Liebowitz, M.L. Liebrez-Himes, R.W. Longstreth, L.M. Maddox, P.B. Malone III, T.E. McCue, C.J. McSwain, T.J. Nagy, J.H. Perry, P.S. Peyser, F. Robles, J.M. Sachlis, D.R. Sheldon, D. Smith Cook, J.B. Thurman, W.G. Wells, Jr., W.J. Wenker, P.W. Wirtz, D.L. Zalkind

Assistant Professors J.H. Beales III, S.N. Cory, E.J. Englander, S.G. Goldberg (*Visiting*), S.S. Hassan, B.C. Horn, G.M. Jabbour (*Visiting*), S.B. Jenkins, D.R. Kane, Z. Karake (*Visiting*), M.S. Klock, J.H. Lin (*Visiting*), L.C. Moersen, C.C. Shepherd, Jr., L.G. Singleton, K.E. Smith, R. Soyer, P.R. Witmer (*Visiting*)

### Committees\*

#### DEAN'S COUNCIL

J.M. Cary, E.J. Englander, J.F. Kasle (*Chair*), D.C. McGrath, L.C. Moersen, R.G. Shouldice

#### COMMITTEE ON CURRICULUM AND PROGRAMS

B.L. Catron, K.J. Darr, S.S. Fuller, L. Graff, M.M. Harmon (*Chair*), J.H. Perry, F.W. Segel

#### COMMITTEE ON DOCTORAL STUDIES

D.E. Gale, W.W. Hardgrave, D.L. Infeld, C.J. McSwain, C.M. Paik, F. Robles, P.B. Vaill (*Chair*)

#### COMMITTEE ON GRADUATE STUDIES

S. Greene, M.M. Harmon, Z. Karake, D.C. Kennedy, P.B. Malone (*Chair*), C. Mallon-Harris, P.N. Reeves, D. Smith Cook, K.E. Smith, M. Vann

#### COMMITTEE ON UNDERGRADUATE STUDIES

M.S. Katzman (*Chair*), S.N. Cory, D. Driver, D.C. Kennedy, J. Liebowitz, C. Mallon-Harris, C.C. Shepherd, G.W.G. Stoner, M. Vann

### INTRODUCTION

Organized as the School of Government in 1928, the School of Government and Business Administration has been responsible for over half a century for the professional development of individuals assuming membership and leadership roles in society. The School comprises six departments—Accountancy, Business Administration, Health Services Administration, Management Science, Public Administration, and Urban and Regional Planning. The use of a multidisciplinary approach in educational programming helps prepare both the generalist and specialist for professional careers in today's complex, organizational society.

\* The Dean and Associate Dean of the School are *ex officio* members of all committees.



### Purposes

The School of Government and Business Administration is dedicated to academic excellence through the study, teaching, and research of management and policy in the public and private sectors, both within the United States and internationally.

Over a span of half a century, the School of Government and Business Administration has developed a learning community in which mature individuals can prepare themselves to assume membership and leadership roles in society. The School practices a multidisciplinary approach with flexibility in educational programming in the belief that such is essential to dealing with the complexities of today's organizational society. The School offers preparation of both the generalist and the specialist for professional careers and seeks to improve the quality and character of the individual as citizen, professional, and scholar as well.

More specifically, the purposes of the School are

1. To prepare its graduates for positions in the management of complex organizations.
2. To provide a broad and fundamental education as preparation for positions carrying management and leadership responsibilities.
3. To provide specialized educational opportunities as preparation for career positions in professional disciplines or functional areas.
4. To explore in all their forms, through education and research, the content, interactions, and interdependencies of disciplines and institutions in the public and private sectors, both nationally and internationally.
5. To make available the School's resources to business, health, government, community, and other organizations in both the metropolitan area and the larger community.
6. To foster understanding and advancement of knowledge and skills in the world community through research, education, and scholarly exchange with governments, institutions, and organizations engaged in the solution of international trade and investment problems and in the management of human settlements.

### Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and the undergraduate and master's programs in business administration are accredited by the Assembly. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planning Association. The Master of Association Management degree program is recognized by the American Society of Association Executives. The School is a member of the National Association of Schools of Public Affairs and Administration, and its Master of Public Administration degree program is accredited by the NASPAA Commission on Peer Review and Accreditation.

### Fellowships

The School of Government and Business Administration has several undergraduate and graduate fellowships available to its students, including the



yamehr Research Fellowships in International Business, the Business Administration Departmental Fellowships, the Government Intern Scholarship Program, Health Services Administration Fellowships, Ernst and Whinney Grants to Doctoral Candidates in Accounting, the National Association of Purchasing Management Fellowship, the Wolcott Foundation Scholarships, the Minority Students Fellowships, the Hyundai Foundation Scholarships, the Public Administration Faculty-Alumni Scholarships, Government Career Development Scholarships, and the George Washington University Fellowship for Ph.D. Studies in Government and Business.

## REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulations.

### Attendance

A student may not attend classes until registration is completed. The student is held responsible for all of the work of the courses in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up the work missed. A student suspended for any cause may not attend classes at GWU during the period of suspension.

### Withdrawal

Withdrawal from a course or from the University without academic penalty is permitted during the first five weeks after registration for the fall or spring semester. Withdrawal after this period is permitted only in unusual circumstances and requires certification by the instructors of courses for which the student is registered that the student is doing passing work (see Withdrawal, under Regulations).

### Adding Courses

Courses may not be added after the first two weeks of classes in any semester.

### Independent Study Plan

A junior, senior, or graduate student of demonstrated capacity, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific credit hours normally allowed when a course is taken on a class basis.

### Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

### Students from Other Schools Within the University

Degree candidates from other schools of the University cannot register for more than 18 hours of credit in courses from the Bachelor of Accountancy or Bachelor of Business Administration degree programs or 12 hours of credit from the



Master of Accountancy, Master of Taxation, or Master of Business Administration degree programs. Typically, a maximum of 6 hours of credit is permitted in courses from the Bachelor of Accountancy program, unless an advisor recommends an additional 3 credit hours.

### Common Body of Knowledge

Programs leading to the degrees of Bachelor of Accountancy, Bachelor of Business Administration, Master of Accountancy, Master of Taxation, and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. A background of the concepts, processes, and institutions in the production and marketing of goods and services and the financing of the business enterprise or other forms of organization.
2. A background of the economic and legal environment as it pertains to profit and nonprofit organizations, along with ethical considerations and social and political influences as they affect such organizations.
3. A basic understanding of the concepts and applications of accounting, quantitative methods, and information systems.
4. A study of organization theory and behavior and interpersonal communications.
5. A study of administrative processes under conditions of uncertainty, including integrating analysis and policy determination at the overall management level.

### THE BACHELOR'S DEGREES

The School offers programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration with fields of instruction in business, economics and public policy; finance; information processing; international business; logistics, operations, and materials management; marketing; and personnel management.

### ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program studies contemplated are required.

Requirements for admission to the freshman class include

1. An acceptable certificate of graduation from a U.S. secondary school, showing at least 15 units,\* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting a U.S. secondary certificate with its foreign equivalent must also show competence in the English language by scoring not less than 550 on the first taking of the TOEFL or 600 on the second taking. International students may be required to take an English proficiency examination and may be required to enroll in a full-time program in English before beginning studies in a degree program.

\* A unit represents a year's study in a secondary school subject, including in the aggregate less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.



2. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test, or on the American College Testing battery. Although no minimum scores are prescribed, test results are an important factor in determining admission eligibility. Students with SAT verbal scores below 500 and SAT math scores below 550, or with ACT composite scores below 25, must show superior performance in their secondary school programs for favorable consideration for admission.

Criteria for admission include a strong high school record and a satisfactory performance on the College Board examinations. It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, N.J. 08541-6200, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, P.O. Box 168, Iowa City, Iowa 52243. It is recommended that the applicant take the tests in October of the senior year.

#### **Admission With Advanced Standing**

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University, are as follows.

Any newly admitted student who plans to register in the School of Government and Business Administration for the first time and whose native language is not English must take an English as a Foreign Language placement test. A student failing to pass this examination will be required to complete successfully the appropriate English composition course or courses, and the assignment of credit for any previously completed courses at another institution will be held pending completion of this requirement.

Students who have accumulated fewer than 30 semester hours of transferable, relevant academic credit must have a minimum 2.5 cumulative grade index and meet freshman admission standards. Students who have accumulated 30 or more semester hours of transferable credit must have a cumulative grade index higher than 2.5. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of C or better, and may be applied toward a degree, provided they are comparable to the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing be granted for course work completed at regionally accredited community or junior colleges. These 60 hours may include credit granted for completed course work equivalent to BAd 104 and Mgt 119. Other courses (one course per area up to a maximum of three courses), comparable to this School's courses numbered 101-200, taken at an accredited community or junior college with an earned grade of C or better, may be accepted to waive certain required courses. The waiver of a required course does not entitle the student to any semester hours of credit and does not reduce the total number of credits that must be completed to earn the degree.

Although a grade of D is not acceptable for transfer of credit, the course may be used to waive a comparable curricular requirement. Credits earned with a D grade may not, however, be counted toward the total number of semester hours



required for the degree. Any course completed with a grade of D or better may not be repeated for the purpose of earning degree credit. An exception to this rule is the freshman English composition requirement, Math 31 or 51 (or their equivalents), and all accountancy courses. Any student earning a D in such courses at another institution may be required to repeat the courses at this University.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally. No more than 3 credit hours per course will be accepted as transfer credit.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, Rice Hall, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division of the University must submit a formal application of transfer to the Office of Admissions in Rice Hall.

Courses taken in another degree-granting division of this University may be applied toward a degree in this School, provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of such credit may be applied toward a degree program in this School. However, in no case will credit for more than 15 semester hours of undergraduate course work taken at this University in nondegree status be allowed toward meeting degree requirements in this School.

### Readmission

A student who withdraws, is suspended, or is otherwise absent without authorization from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. If the student has attended one or more regionally accredited colleges or universities during absence from the University, complete official transcripts must be sent to the Office of Admissions from each institution attended.

The application fee is waived for a student applying for readmission who was registered as a degree candidate at the time of last registration at the University and has not since registered at another college or university.

## DEGREE REQUIREMENTS

### Academic Work Load

A full-time student not on probation may not ordinarily take more than 18 semester hours. A student employed more than 20 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or higher may take up to 18 semester hours. A student employed more than 20 hours a week whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time during a semester must report immediately to the dean so that the program may be adjusted if necessary.

Exceptions to these rules require the approval of the dean.

An undergraduate student on probation may take no more than 12 semester hours of course work.



### Scholarship Requirements

A student must have the following to graduate: (1) an overall quality-point index of at least 2.00 and (2) a quality-point index of at least 2.00 in all required 100-level B.B.A. or B.Acct. courses and field-of-instruction-related courses. All courses taken at George Washington University that are acceptable for credit toward the bachelor's degrees are to be included in the *overall quality-point index* calculation. Elective courses in or out of the School of Government and Business Administration cannot be used as substitutes for required courses in the calculation of the *field quality-point index*.

### DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list is limited to (1) full-time students registered for a minimum of 12 semester hours (provided that the 12 hours are taken for a grade) and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

### INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of I (Incomplete) or W (Authorized Withdrawal) may be assigned are described under Regulations.

The grade of I must be changed by a date agreed on by the instructor and the student but no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of I is assigned. An Incomplete that is not changed within this period automatically becomes an F. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of I cannot be changed by re-registering for the course here or by taking its equivalent elsewhere.

The grade of Z (Unauthorized Withdrawal) is assigned when students are registered for a course they have not attended and in which they have done no substantial graded work. The grade of Z is not calculated in the overall and major quality-point indexes.

### PROBATION

A student whose quality-point index (either overall or in the major) falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts another 12 semester hours of work, which may include remedial studies as prescribed.

### SUSPENSION

A student whose quality-point index (either overall or in the major) is 1.50 or below in any semester or remains below 2.00 at the end of the probationary period will be suspended. A student suspended for poor scholarship may apply for readmission after the end of the fall or spring semester following the date of suspension. To be considered for readmission, the student must submit evidence of remedial activity performed during the suspension period and evidence of renewed potential ability to do college-level work. No advanced standing will be assigned for academic work completed while the student is suspended, but the



student may petition the Dean for consideration of advanced standing after completing a minimum of 12 semester hours of course work here and achieving a cumulative and field index of at least 2.00.

A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 for each 12 semester hours of work undertaken until the cumulative and field index are at least 2.00. In no case will the probationary period after readmission exceed 24 semester hours of study. A student suspended twice for poor scholarship will not be readmitted.

#### PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better may, with the approval of the advisor and the dean, take one course per semester and receive a grade of P, Pass, or NP, No Pass, which will be recorded on the student's transcript but will not be reflected in the quality-point index. A student will be allowed to take more than four pass/no pass courses. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the last date to add a course (except in the case of a prerequisite to Math 51). Required courses may not be taken on the pass/no pass basis. A transfer student may choose this option until the second semester of enrollment in the University.

#### GRADE OF F

Should an undergraduate student earn a grade of F in a required course, that course must be repeated for a passing grade at George Washington University. A grade of F earned in a required or elective course remains a part of the student's record and is calculated into the quality-point index.

#### Residence

A minimum of 30 semester hours, including at least 12 semester hours of required B.B.A. or B.Accy. courses, must be completed while registered in the School of Government and Business Administration. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean, to pursue work elsewhere, the work of the senior or final year must be completed in the School of Government and Business Administration.

#### Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in this School.

#### Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours or waive curricular requirements by performing satisfactorily on the following tests:

**College-Level Examination Program (CLEP)**—See Admissions for general information on the CLEP tests. CLEP tests in Introduction to Business, Communications, Law, and Data Processing are limited to 3 credits each of advanced standing. CLEP tests in college algebra/trigonometry, English composition, and more advanced courses in accounting and business administration are not accepted for advanced standing. Matriculated students who wish to receive credit for CLEP General and Subject Examinations must receive prior approval, through petition, of their advisor and the dean.



*Advanced Placement Tests and Achievement Tests*—See Admissions.

*Examinations for Waiving Curriculum Requirements*—The School of Government and Business Administration does not administer waiver examinations. However, certain arts and sciences courses may be waived, and in some instances credit may be assigned, by satisfactorily passing a special departmental examination approved by the department or designated advisor. Requests to take the examination should be made to the designated advisor and the required fee paid at the Office of the Cashier before the date set for the examination. See page 73 for more information.

### **Cooperative Education Program**

The School of Government and Business Administration has entered into several Cooperative Education agreements with U.S. government agencies in the Washington, D.C., area. Students who are selected to participate in these programs generally work in paid employment for one semester and attend school the next semester. Since these programs are currently designed for juniors and seniors, program length is for one- and two-year periods. The areas of work are closely integrated with the student's field of instruction (e.g., marketing, finance, etc.). Interested students should contact the Director of the School's Office of Experiential Learning and Internships or the Chairman of the Department of Business Administration for specific guidance and details.

### **Study Abroad Programs**

Study abroad programs for the academic year are currently available in England, France, Germany, Japan, China, and Peru. Students who wish to study in countries not mentioned here should check with the office of the dean. Credits earned with acceptable grades are transferable toward the appropriate degree at George Washington University, provided there is no duplication of work done previously. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. Information may be obtained from the Study Abroad Office, Stuart Hall, Room 102. Study abroad is available at varying locations during the summer. Information on summer programs abroad is available in the *GWU Summer Sessions Announcement* and through the Division of Continuing Education.

### **THE BACHELOR OF ACCOUNTANCY**

The principal objective of the Bachelor of Accountancy degree is preparation for a professional career in accounting. Although professional preparation requires specialization in the acquisition of accounting knowledge in the junior and senior years, attainment of the objectives requires a general education in English, humanities, social sciences, mathematics, and sciences in the first two years of undergraduate study. In addition, a common body of knowledge in business administration is necessary during the junior and senior years, with special reference to the needs of the student in the accounting program. An additional objective is the preparation of students for a fifth-year or Master of Accountancy program that is intended to meet the academic needs of students seeking professional accounting careers in the public or private sector, which currently demand high entry-level academic achievement.

One hundred twenty semester hours are required for graduation. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites. Math 3, 6, 9, and 10 may not be used for credit toward the Bachelor of Accountancy.



**Curriculum for the Pre-Accountancy Program\*****FRESHMAN YEAR**

Economics:	Econ 1-2 .....
English:	Engl 9 or 10, 11 .....
Mathematics:	Math 31-32 or 51-52 .....
Science:	BiSc 3-4; Chem 3-4; Geol 1-2; or Phys 9-10 .....
Social Sciences:	PSc 2; Soc 1 .....
Total .....	

**SOPHOMORE YEAR**

Accountancy:	Accy 51-52 .....
Economics:	Econ 121 .....
Social Sciences:	Psyc 1 and 8; Phil 45 or 51 and 135 .....
Statistics:	Stat 51 .....
Communication:	Comm 111 .....
Computer Studies:	Mgt 58 .....
Total .....	

**Curriculum for the Accountancy Program****JUNIOR YEAR**

Accy 101:	Cost and Budgetary Control .....
Accy 121:	Intermediate Accounting .....
Accy 151:	Business Law for Accountants I .....
Accy 152:	Business Law for Accountants II <b>or</b> .....
Accy 162:	Federal Income Taxation of Corporations .....
Accy 161:	Federal Income Taxation: Individuals .....
Accy 191:	Advanced Accounting .....
BAd 120:	Business Finance .....
BAd 140:	Basic Marketing Management .....
BAd 191:	Fundamentals of Management .....
Engl 102:	Written Communications in Accounting .....
Total .....	

**SENIOR YEAR**

Accy 132:	Accounting Theory .....
Accy 171:	Auditing .....
Accy 181:	Accounting Systems .....
BAd 101:	The Business Environment .....
BAd 110:	Human Resources Management <b>or</b> .....
Mgt 107:	Fundamentals of Behavioral Science .....
BAd 160:	Introduction to International Business <b>or</b> .....
BAd 166:	International Marketing Management <b>or</b> .....
BAd 171:	International Business Finance .....
BAd 188:	Managing Production/Operations .....
BAd 197:	Strategy Formulation and Implementation .....
Stat 103:	Sampling in Accounting .....
Elective:	Chosen from Columbian College or the School of Government and Business Administration .....
Total .....	

\* To be accepted in the Bachelor of Accountancy program a cumulative quality point index of 2.50 or higher is required at the start of the junior year.



## THE BACHELOR OF BUSINESS ADMINISTRATION

One hundred twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours of course work in the junior and senior years selected from one of the fields of instruction offered by the School. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites. The field of instruction must be selected no later than the first semester of the junior year. Math 3, 6, 9, and 10 may not be used for credit toward the B.B.A. degree. The second semester of a first-year language course that was previously studied in high school may be taken as a sophomore elective, provided the student places (via test) at this level.

### Curriculum for the First Two Years for All Bachelor of Business Administration Students

#### FRESHMAN YEAR

Mathematics:	Math 31-32 or 51-52	6
Economics:	Econ 1-2	6
English:	Engl 9 or 10, 11	6
Science:	BiSc 3-4 or 11-12; Chem 3-4 or 11-12; Geol 1-2; or Phys 1-2 or 9-10	6
Social Sciences:	AmCv 71-72; Anth 1-2; Geog 1, 2, or 3; Hist 39-40 or 71-72; PSc 1, 2; or Soc 1, 2	6
	<b>Total</b>	<b>30</b>

#### SOPHOMORE YEAR

Accountancy:	Accy 51-52	6
Business Administration:	BAd 51	3
Humanities:	Art 31-32 or 71-72; Chin 3-4; Clas 71-72; Engl 51-52, 61-62, or 71-72; Fren 2-3 or 51-52; Ger 3-4, 9-10, or 51-52; Ital 2-3; Mus 3, 4; Phil 45, 51, 52, or 71; Rel 1, 2, 9, 10, or 23; Slav 3-4, 5-6, or 91-92; Span 2-3 or 51-52; Comm 1, 111, or 112; or SpHr 11	6
Management Science:	Mgt 58	3
Social Sciences:	Psyc 1, 8	6
*Elective:	Courses other than accountancy, business administration, management science, or economics	3
Statistics:	Stat 51 or 53	3
	<b>Total</b>	<b>30</b>

### Curriculum for B.B.A. Fields of Instruction

The academic programs comprising these fields of instruction are designed to provide the broad foundation required for eventual leadership in either business or governmental administration. Each field of instruction consists of 33 semester hours of required general business administration courses and 15 hours of required field-related courses. Twelve hours of electives, normally advanced courses in liberal arts subjects, are required in each field but are not included in the calculation of the field quality-point index.

\* Restricted to appropriate 100-level courses. (Certain courses in human kinetics do not satisfy this requirement.)



## JUNIOR YEAR

Required General  
B.B.A. Courses

Accountancy:	One course selected in consultation with the advisor from Accy 101, 111, 121, 161 .....
BAd 110:	Human Resources Management .....
BAd 120:	Business Finance .....
BAd 140:	Basic Marketing Management .....
BAd 191:	Fundamentals of Management .....
Econ 121:	Money and Banking .....
Field-Related Courses:	Six semester hours selected from among courses in the chosen field of instruction .....
†Elective:	To be selected in consultation with the advisor .....
Total	.....

## SENIOR YEAR

Required General  
B.B.A. Courses

BAd 101:	The Business Environment .....
BAd 104:	Commercial Law .....
BAd 188:	Managing Production/Operations .....
BAd 197:	Strategy Formulation and Implementation .....
*Psc 144:	Personnel and Industrial Psychology or .....
Mgt 107:	Fundamentals of Behavioral Science .....
Field-Related Courses:	Nine semester hours selected from among courses in the chosen field of instruction .....
†Elective:	To be selected in consultation with the advisor .....
Total	.....

The field of instruction must be selected no later than the first semester of the junior year. The student should contact the office of Academic Program Scheduling to declare a field of instruction and receive the name of the designated faculty advisor. Fields of instruction are described below.

## 1. Business Economics and Public Policy

This field is directed toward developing understanding and skills applicable to a wide variety of positions in business and government. Students will supplement basic course work in business and economics with additional courses in economics, political science and government-business relations. The social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of governmental programs and regulatory activity will be studied to establish a basis for developing and evaluating effective business responses. The program is concerned with the continuing business-government dialogue on effective and equitable relations between the two sectors of the economy.

The following courses provide a basic academic foundation in the field of business economics and public policy. An asterisk indicates that the course is required for the field of instruction.

BAd 117	Collective Bargaining
BAd 171	International Business Finance
*Econ 101	Intermediate Microeconomic Theory

† Restricted to appropriate 100-level courses in the liberal arts or in travel and tourism, approved by the advisor.

\* Students in marketing take BAd 142, Consumer Behavior, in lieu of this requirement.



- \*Econ 102 Intermediate Macroeconomic Theory
- Econ 136 Natural Resources and Environmental Economics
- Econ 158 Industrial Organization
- Econ 159 Government Regulation of the Economy
- Econ 161 Public Finance I
- Econ 162 Public Finance II
- Econ 181-82 International Economics
- PSc 116 The American Presidency
- PSc 117 Public Administration and Bureaucratic Politics
- PSc 118 Legislative Process
- PAd 125 Managing Public Policy

## 2. Finance

This field helps students develop the skills required for entry-level employment in corporations, financial institutions, and the public sector. Corporations employ entry-level finance specialists for cash, credit, or inventory analysis or management and for work in bank relations and capital budgeting. Financial institutions offer opportunities for entry-level finance specialists to analyze specific securities and to assist in loan analysis. The government sector looks to finance students as potential financial analysts. The undergraduate B.B.A. degree with a finance field also provides an excellent foundation for graduate academic programs, especially the study of law.

The following courses provide a basic academic foundation in the field of finance. An asterisk indicates that the course is required for the field of instruction.

- Accy 111 Financial Statement Analysis **or**
- Accy 121 Intermediate Accounting
- \*BA 123 Investment and Portfolio Management
- \*BA 124 Advanced Financial Management
- BA 130 Working Capital Management
- BA 132 Real Estate Investment **or**
- BA 133 Fundamentals of Insurance and Risk Management
- BA 135 Capital Formation
- BA 171 International Business Finance

## 3. Human Resources Management

This field is concerned with all aspects of the employment of human resources in business organizations. Entry-level career opportunities are in such fields as personnel management, employee relations, collective bargaining, and manpower utilization. Since the field focuses on the management of human resources in a general sense, it also prepares the student for responsibilities associated with general management and leadership.

The following courses provide a basic academic foundation in the field of personnel management. An asterisk indicates that the course is required for the field of instruction.

- \*BA 115 Leadership in Human Resources Management
- \*BA 117 Collective Bargaining
- Jour 145 Principles and Problems of Public Relations
- Psyc 129 Theories of Personality
- Psyc 131 Psychological Tests
- Comm 121 Small Group Communication

## 4. Information Processing

Students taking this field are recruited by organizations in both the public and private sectors for positions as programmer/analysts and systems designers. These entry-level positions lead to careers in the marketing of computer hardware and software, systems consulting, and management. Medium to large organizations are currently expanding their reliance on computer systems, and with the development of inexpensive but powerful mini- and microcomputers, thousands of smaller organizations are finding computers to be cost effective as well.



Students will supplement the basic skills learned in the B.B.A. curriculum with courses planned to provide a firm foundation in the use of the computer as a tool in solving information problems in organizations. These courses relate ongoing, real-world applications of computers to the functional areas of business and government organizations.

The following courses provide a basic academic foundation in the field of information processing. An asterisk indicates that the course is required for the field of instruction.

- †CSci 157 Assembly Language Programming of Large System Computers
- †CSci 158 Algorithmic Methods
- \*Mgt 119 Computer Programming and Data Structures
- \*Mgt 120 Structured Development with CASE
- \*Mgt 121 Expert Database Systems
- \*Mgt 122 Applied Artificial Intelligence
- Stat 130 Computer Programming
- Stat 131 Data Structures

#### 5. International Business

This field provides the basic academic foundations for entry-level positions in international business, particularly in multinational corporations, international banks, and government agencies. Such organizations include the Departments of Commerce, State, and Treasury, plus international institutions such as the Export-Import Bank, World Bank, and Overseas Private Investment Corporation. Students in this field are encouraged to include two years of a modern foreign language in their preparatory background.

The following courses provide a basic academic foundation in the field of international business. An asterisk indicates that the course is required for the field of instruction.

- BAd 123 Investment and Portfolio Management
- BAd 135 Capital Formation
- BAd 143 Marketing Research
- BAd 148 Advertising
- BAd 150 Salesmanship and Sales Management
- \*BAd 160 Introduction to International Business
- \*BAd 166 International Marketing Management
- BAd 168 Foreign Market Analysis
- \*BAd 171 International Business Finance
- BAd 173 International Banking
- BAd 175 International Monetary and Financial Issues
- BAd 182 Transportation Management
- Econ 181 International Economics
- T&T 104 Introduction to Travel and Tourism

#### 6. Logistics, Operations, and Materials Management

Students in this field will become equipped to contribute to the national effort to achieve economy, efficiency, and innovative competitive behavior for the American economy. Many positions in industry and government that deal with material and service requirements, rates of consumption, acquisition, mobility, maintenance, and quality assurance require the skills learned in this field. The field is designed to prepare students for entry-level positions performing the activities necessary to plan and control the flow of materials through the productive system and the external sourcing of required goods and services.

Graduates of the program will be prepared for career positions in government, industry, and consulting firms in such functional management areas as contract administration, purchasing, materials and logistics, maintenance, quality assurance, planning, requirements, project administration, price analysis, and contract administration or in support work.

The following courses provide the foundation for effective functioning in the field of logistics, operations, and materials management. An asterisk indicates that the course is required for the field of instruction.

† See the School of Engineering and Applied Science Bulletin.



- BAd 117 Collective Bargaining
- BAd 143 Marketing Research
- \*BAd 180 Materials and Purchasing Management
- BAd 181 Management of Public Acquisitions
- BAd 182 Transportation Management
- \*BAd 183 Logistics Management
- \*BAd 184 Contract Management
- Mgt 119 Computer Programming and Data Structures

## 7. Marketing

This field has the objectives of (1) developing a conceptual understanding of a complex and changing environment and its effects on marketing activities and institutions, (2) understanding the dynamics of buyer behavior, (3) providing the skills to analyze demand, market segments, and cost-volume profit relationships of marketing programs, (4) enhancing abilities in written and verbal communications, and (5) developing skills in formulating and implementing comprehensive marketing plans.

Typical entry-level positions for students with a marketing field are advertising account executives, marketing research project managers, retail assistant buyers, and sales representatives for consumer or industrial products firms. Students with marketing backgrounds also have obtained positions in physical distribution, public relations, wholesale firms, and a variety of governmental and nonprofit organizations.

The following courses provide a basic academic foundation in the field of marketing.† An asterisk indicates that the course is required for the field of instruction.

- \*BAd 143 Marketing Research
- BAd 148 Advertising
- BAd 149 Advanced Advertising Campaigns
- \*BAd 150 Salesmanship and Sales Management
- BAd 152 Retailing Management
- \*BAd 159 Marketing: Strategic Planning
- BAd 160 Introduction to International Business
- BAd 166 International Marketing Management
- BAd 180 Materials and Purchasing Management
- BAd 182 Transportation Management
- BAd 183 Logistics Management
- Jour 145 Principles and Problems of Public Relations
- Stat 105 Statistics in the Behavioral Sciences
- Mgt 119 Computer Programming and Data Structures

## Secondary Field of Study

A secondary field of study in business administration is available in the School of Government and Business Administration. See the brochure *Secondary Fields of Study*, available in the Office of Academic Program Scheduling.

## THE MASTER'S DEGREES

### ENTRANCE REQUIREMENTS

To be considered for admission, applicants must present a bachelor's degree from a regionally accredited college or university. Application is made directly through the Office of Enrollment Development and Admissions, School of Government and Business Administration. Admission to master's programs is highly competitive. Previous academic history, performance on the applicable entrance examination, letters of reference, motivation and aptitude to do graduate-level work, and professional experience are all taken into consideration.

† BAd 142 cannot be used as a field of instruction course.



Applicants for admission to programs leading to the degrees of Master of Accountancy, Master of Taxation, and Master of Business Administration must submit scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Health Services Administration and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test or the Graduate Record Examination; applicants for admission to programs leading to the degree of Master of Public Administration, Master of Association Management, and Master of Science in Information Systems Technology must submit scores on the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, NJ 08541. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination to Box 955. Test scores that are more than five years old are not accepted for admissions review.

**International Students**—Students whose native language is not English and who have not earned a bachelor's or master's degree from a regionally accredited college or university in the United States are required to take the Test of English as a Foreign Language (TOEFL). A minimum TOEFL score of 550 is required for consideration for admission.

Admitted students whose TOEFL scores range between 550 and 600 will be required to take the University's English as a Foreign Language placement test prior to their first registration. Depending on the results of this test and subsequent class performance, the student's first-year academic program may be restricted in the number and type of courses that can be taken. Students assigned to English as a Foreign Language (EFL) courses should anticipate additional related tuition expenses as well as a possible extended period of time required to complete their degree program.

For those students required to take EFL courses, the School's minimum English language proficiency requirement is considered to be satisfied either (a) successful completion of EFL 50 (*English Composition/Research Methods for International Students*) with a minimum grade of B; or (b) an evaluation by the Director of English for International Students indicating that the student has achieved comparable proficiency status.

**Transfer Within the School**—Currently enrolled students wishing to transfer from one graduate degree program and/or field of instruction to another within the School must complete an Application for Transfer through the Office of Enrollment Development and Admissions. Applicants for transfer are subject to requirements in effect at the time of transfer.

### GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester hours of graduate course work required beyond First-Level (Common Body of Knowledge) or other required courses may be approved for transfer to the School of Government and Business Administration from the Division of Continuing Education or another degree-granting division of this University, or another regionally accredited college or university under the following conditions: The course work must be approved as part of the student's program of studies; it must not have been applied to the completion of requirements for another degree; it must be at the graduate level, it must have been taken within the two years prior to acceptance into the program, and the student must have received a grade of B or better. The action must be approved by a petition to the designated faculty advisor and the



dean. A transcript and description of the course work must be on file before the petition can be considered. Should advanced standing be granted, the credit will count; however, only grades earned in SGBA courses in the Departments of Public Administration, Health Services Administration, and Urban and Regional Planning while in nondegree status will be used in calculating the cumulative quality-point index.

Extended programs, including undergraduate or graduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, completion of an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or field of instruction.

Second-group courses (numbered 101-199) may be counted toward the master's degree only when registration for graduate credit has been approved by petition at the time of registration by the dean and the designated faculty advisor. No work counted toward a bachelor's degree may be counted toward a master's degree. However, a student who has completed the equivalent of a Common Body of Knowledge course with a grade of C or better as part of the bachelor's degree program may request by petition a waiver of that course at the master's level. A grade of C earned in Econ 217 and 218 at GWU while in degree or nondegree status is sufficient to waive that portion of the Common Body of Knowledge requirement.

Full-time students are expected to register for a minimum of 9 to a maximum of 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than 6 semester hours. All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean.

Students who expect to continue studies for a doctoral degree after receiving the master's degree should ask for assistance in planning their programs of study.

No credit is granted for work done in absentia or without formal instruction, except for hospital residency, supervised field experience, independent study, and the thesis, which may be completed in absentia with the permission of the department, designated faculty advisor, or committee concerned.

### MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in the Master of Science in Information Systems and Master of Urban and Regional Planning programs. Degree candidates should consult designated faculty advisors about examinations required and material to be covered. In writing the examinations, students are expected to demonstrate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections broadly cover the various fields that the candidate has selected.

Examinations are generally scheduled in the fall and spring semesters and should be taken during the last semester of course registration or shortly after completion of prescribed course work.

A written application is filed with the department supervising the student's field of study at the time of registration for the semester in which the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 (B) average. After applying for the examination, a candidate may withdraw only by written notice to the department chairman.



A candidate who fails the examination should consult with the designated advisor about a subsequent course of action.

### SCHOLARSHIP REQUIREMENTS

Grades for graduate work are A, Excellent; B, Good; C, Minimum Pass; F, Fail; I, Incomplete; IP, Progress; CR, Credit; W, Authorized Withdrawal; and Z, Unauthorized Withdrawal.

An average of B or better is required for the master's degree. The grade of C is not considered as failing but must be balanced by a grade of A in a graduate course of equal status. A minimum quality-point index of 3.00 is required for award of a graduate degree. All graduate courses and undergraduate courses taken for graduate credit after matriculation as a degree candidate (except those audited or taken for the grade of CR) will be used in the calculation of the quality-point index.

A student whose quality-point index falls below 3.00 after completing a minimum of 12 semester hours will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of F is required to present a cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of F in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of B. (Such a repeat does not expunge the grade of F, which remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

### Suspension

A graduate student who does not meet the conditions of probation (see above) will be suspended. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence that indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index, a second suspension will result and subsequent readmission will be denied.

### Incomplete/Withdrawal

Conditions under which the grades of I (Incomplete), W (Authorized Withdrawal), or Z (Unauthorized Withdrawal) may be assigned are described under Regulations.

The grade of I must be changed by a date agreed on by the instructor and the student but no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of I is assigned. An Incomplete that is not changed within this period automatically becomes an F. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be



submitted within the same period. The grade of I cannot be changed by re-registering for the course here or by taking its equivalent elsewhere.

### The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the semesters in which registered for thesis seminar (299) and/or thesis research (300), to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis research, the student must register for the entire required hours of thesis again and pay additional tuition.

### MASTER OF ACCOUNTANCY

The Master of Accountancy degree is designed to prepare students for professional careers in accounting either in the public or private sector. A particular objective of the program is the student's attainment of professional certification. The Master of Accountancy is recognized as the necessary fifth year of education in a professional accounting program, and as such, it is superimposed on a Common Body of Knowledge in accounting and business subjects. The Common Body of Knowledge is ordinarily attained by the completion of a bachelor's degree in accounting or business from a regionally accredited institution of higher education.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed prior to admission. Six semester hours of course work of the minimum program of 33 hours may be awarded as advanced standing.

Students should verify state regulations concerning the Certified Public Accountant Examination for the state in which they plan to practice.

The program of study consists of two levels.

#### First Level: Common Body of Knowledge Courses (30 semester hours)

Accy 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270

This set of courses must be completed prior to enrollment in Second-Level courses, except Accy 297, which must be taken in the last semester of the program. All of these course requirements, except Accy 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

#### Second Level

Accy 221, 225, 251, 261, 275, 282; one course chosen from Accy 262, 263, or 264; and three graduate-level courses chosen from accountancy with advisor approval. A maximum of three taxation courses may be included in the program.



### MASTER OF ASSOCIATION MANAGEMENT

The Master of Association Management prepares students to undertake or advance in careers in association management. It is also for practitioners who already work with nonprofit associations of various kinds—trade, public interest, membership, and special interest associations; scientific, technical, and learned societies; trade unions; political action committees; religious and fraternal organizations; foundations; and local ad hoc groups.

The 42-semester-hour program is interdisciplinary, with four academic departments participating in it—Public Administration, Business Administration, Management Science, and Accountancy. The program consists of a ten-course core, three other required courses, and an elective course.

#### Required Courses

##### Core Courses (30 semester hours)

- AM 270 The Association: Roles, Influence
- AM 271 Marketing Management for Associations and Other Organizations
- AM 272 Communications and Media Relationships for Associations
- AM 273 Association Law and Lobbying **or**
- AM 274 Marketing Strategy for Associations
- AM 275 Information Systems for Associations
- AM 276 Organization and Management of Associations
- AM 277 Financial Management for Associations
- AM 279 Current Issues in Association Management
- PAd 295 Research Methods
- PAd 296 Statistical Applications in Public Administration

##### Any two of the following courses (6 semester hours)

- PAd 212 Legislative Management
- PAd 213 Administration in the Federal Government
- PAd 215 Law and the Public Administrator
- PAd 216 Federal Government Regulation of Society
- PAd 242 Administration of State and Local Government
- PAd 245 Intergovernmental Relations

##### In addition, any one of the following courses (3 semester hours)

- PAd 223 Behavioral Factors in Large and Complex Organizations
- PAd 224 Managerial Leadership in Complex Organizations
- Mgt 210 Individual and Group Dynamics in Organizations
- Mgt 212 Behavioral Factors in the Process of Change
- Mgt 213 Organizational Development: A Management Function
- BAd 210 Human Resources Management

##### Elective (3 semester hours)

With the approval of the advisor, the student may satisfy this requirement by choosing any graduate-level course either from the above offerings or from other courses within the University.

#### Substantive Areas

Courses comprising this degree cover the six substantive areas described below.

##### MARKETING STRATEGIES AND REPRESENTATION

This area emphasizes the relationship between association members and managers and the means of conveying the association point of view to legislators



administrators, and the public at large. The association is viewed as the central focal point through which various constituent interests are articulated. Principal courses are AM 271 and either AM 273 or 274.

#### COMPARATIVE INSTITUTIONS

Washington-based associations provide a link between association membership and government. This area focuses on comparisons among the various types of associations that comprise the Washington environment and their relationships, interactions, and competition. The courses in this area are AM 270 and two courses chosen from PAd 212, 213, 215, 216, 242, and 245.

#### COMMUNICATIONS, MEDIA, AND INFORMATION SYSTEMS

Communication is a vital factor in modern management and is particularly important in the management of associations. The focus in this area is on elements of interpersonal communication with board, staff, and other association members and on the preparation, editing, and publication of journals and other written materials. Emphasis is placed on an appreciation of the value of continuing relationships with the media. The principal courses in this area are AM 272 and 275.

#### FINANCE AND ACCOUNTING

The curriculum includes consideration of the problems of financial planning, budgeting, accounting, and economics that are essential to all association management. The principal course, required of all students, is AM 277.

#### ANALYTICAL AND RESEARCH METHODS

Courses comprising this area emphasize competence in research design and methods and in the application of statistical analysis. All students are required to take PAd 295 and 296.

#### ASSOCIATION MANAGEMENT

This area focuses on the problems of managing association staffs. It concerns itself with the day-to-day problems of large and growing staffs and regional offices. The principal courses include AM 276 and 279, plus a course selected from PAd 223, 224; Mgt 210, 212, 213; or BAd 210. AM 279, the capstone seminar, must be taken during the student's final semester of study; it addresses the overall problems of association management, tying together what has been previously studied, with particular reference to growing legal restrictions that are placed on association managers.

#### MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is designed to prepare students for careers in management. The program of study leading to the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision making. The program provides a study in depth in one field of instruction and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed at a regionally accredited



college or university prior to admission. Thus the shortest possible program is 36 semester hours.

The program of study consists of two levels and contains four components:

*First Level: Common Body of Knowledge Courses (30 semester hours)*

Econ 217-18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 240, 297

This set of courses must be completed prior to enrollment in Second-Level courses, except BAd 297 which must be taken in the last semester of the program. All of these course requirements, except BAd 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. Common Body of Knowledge courses not completed before the applicant matriculates in the School of Government and Business Administration will be assigned in the letter of admission. First-Level courses may not be taken to satisfy Second-Level requirements (breadth, field of instruction, elective courses).

*Second Level*

*1. Breadth Courses (15 hours)*

Breadth courses provide exposure to a broad range of subjects intended to develop professional competence in general management. In consultation with a faculty advisor, students select five courses from at least four teaching fields outside the field of instruction. Students may design a program in consultation with their advisor that is tailored to individual career goals.

*2. Field of Instruction Courses (12 hours)*

This set of courses gives students depth of understanding in a selected field. Courses are selected in consultation with the faculty advisor and may be tailored to individual interests.

*3. Elective (3 hours)*

Students may select any graduate-level course to satisfy this requirement after consultation and approval of the faculty advisor.

*4. Required Common Body of Knowledge Course (3 hours)*

This course, BAd 297, Strategy Formulation and Implementation, is a required capstone course for all M.B.A. students. It must be taken in the last semester.

**Fields of Instruction**

Students select a minimum of 12 semester hours from one of the following fields:

**BUSINESS ECONOMICS AND PUBLIC POLICY**

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special attention is given to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision making, government regulation of business, government-business liaison functions, and public administration.

**DECISION SYSTEMS**

At all organizational levels, decision making is among the most important and most difficult responsibility of managers. This field prepares students to work with systems to improve and assist the decision process. The field is application oriented and utilizes mathematical, statistical, and computer models. The str



dent may choose either of two tracks: quantitative analysis for decision making, which focuses on the operations research content of decision systems, or decision support systems, which emphasizes computerized systems that support the decision process.

#### FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting, and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than of substantive difference.

#### HUMAN RESOURCES MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions, and local, state, and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations, and manpower utilization.

#### INFORMATION SYSTEMS MANAGEMENT

This field is concerned with issues related to modern information and decision support systems in private and governmental organizations. Areas include systems analysis, user-system psychology, and trends in information systems.

The program is designed for the professionals responsible for analyzing the information system needs of an organization and developing an implementation plan for meeting requirements. Plans would deal with the determination of the information needs and information flows within the organization. The information system professional selects the proper blend from the options available: information systems, database management systems, decision support systems, and expert systems. These decisions are based on knowledge of available technology and an understanding of the psychological aspects of user acceptance and productivity.

#### INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in international banking, international and multinational corporations, and export trading companies; for careers in the federal government and in international agencies concerned with business, industry, and finance abroad; and for the commerce option of the Foreign Commercial Service.

The program is also designed to provide international students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.



## LOGISTICS, OPERATIONS, AND MATERIALS MANAGEMENT

This field addresses issues related to management and operating skills in the several work areas it encompasses at the national and international level as well as in the private and public sectors. Activities in this field include material acquisition, production, quality control, distribution, maintenance, and support functions throughout the life of the organization, system, or product. Personnel skilled in these activities stimulate organizations to increase productivity and organizational effectiveness.

The program focuses on the integration of the administrative functions associated with transactions, technology, production, and services necessary to institutional success. The field is designed to provide students with knowledge in acquisition and logistics functions and to develop the capacity to analyze information, define problems, evaluate quality, assess impacts, and draw conclusions pertinent to logistics plans and operations. Students are encouraged to emphasize formulation of objectives, planning, and management of operations throughout the system life cycle. Each student elects a study track (procurement and contracting, physical distribution, or product operations) in consultation with a designated advisor.

## MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of state-of-the-art technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

## MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are Marketing Management, Buyer Behavior, and Marketing Research. Functional courses are Promotion Management, Marketing Channels, Marketing Strategy, and Product/Service Management. Specialized elective courses—International Marketing, Industrial and Government Marketing, and Marketing and Public Policy—utilize the resources of the Washington metropolitan area.

## ORGANIZATIONAL BEHAVIOR AND DEVELOPMENT

This field of study reflects the assumptions that the effective utilization of the behavioral sciences is concerned with both means and ends and that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the



student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a human system's total resources.

This program helps meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

#### SYSTEMS THEORY AND CYBERNETICS

This field provides a broad, interdisciplinary perspective for dealing with complex management problems. Systems theory identifies principles of organization common to physical, biological, and social systems, while cybernetics is defined as the science of communication and control in man, machine, and society.

As the size and complexity of organizations increases and as social and technological change accelerates, this field has evolved as a mode for understanding the underlying principles of organization and management with profound relevance for the operating manager or policymaker in the private or public sector.

Because the program is interdisciplinary and transcontextual in nature, students are afforded an unusually broad range of opportunities to apply their educational experience. Professional and academic career potentials are available in general management of public and private organizations, especially those in high-technology and international fields; staff and consulting work in fields such as strategic planning, organizational development, public affairs; technical studies in systems analysis and engineering, information system design and development, and systems science; and research and teaching in systems theory and cybernetics programs.

#### URBAN DEVELOPMENT

This field is designed to provide interdisciplinary and applied studies for students preparing for a business career in urban development processes. The field combines the fundamental economic principles and concepts that govern the urban investment and development process with those that emphasize the analysis of specific projects, including site requirements and physical relationships, holding capacity, market conditions, financial feasibility and requirements, legal framework and constraints, and opportunities associated with the public sector and long-term community needs.

The field prepares students for careers in mortgage banking, housing, construction and building management, real estate sales and appraisal, development planning and public policy, commercial leasing and marketing, financing, and construction lending.

#### MASTER OF HEALTH SERVICES ADMINISTRATION

The Master of Health Services Administration degree program is designed to provide a core of generalist administrator courses for all students, coupled with specialized elective fields of instruction to meet the interests and career objectives of individual students.

The program of study consists of 54 semester hours of course work. In addition, 3 semester hours each in accountancy, economics, and statistics are prerequisite if comparable study has not been completed prior to matriculation as a degree candidate.



The generalist core includes the following nine courses: HSA 202, 203, 207, 210, 211, 212, 215, and Mgt 210. In addition, each student must take two advanced HSA courses, one chosen from Group I and one from Group II, from among the following:

Group I (Policy/Planning)—HSA 221, 223, 225, 227, 252, 255.

Group II (Management)—HSA 231, 233, 235, 236, 237, 238, 239.

During the last semester on campus, each student must also complete HSA 245, which serves to integrate the concepts and methods of health services administration.

The fields of instruction each comprise 18 credit hours, including an experiential learning component. In some fields of instruction, a one-year (semester-hour) administrative residency is mandatory. In other fields of instruction, the student may choose a 3-semester-hour internship and 6 semester hours of additional course work as a substitute for the 9-hour residency. Consequently, fields of instruction fall into one of two patterns:

*Residency Option*—Specialist course work, 9 hours; administrative residency, 9 hours. Students will not be permitted to enter any administrative residency unless they have attained a 3.0 quality-point average with no grades of I.

*Internship Option*—Specialist course work, 15 hours; administrative internship, 3 hours.

Courses comprising the field of instruction may be taken in the Health Services Administration Department, the School of Government and Business Administration, the University, or the Consortium of Universities. Each student develops a set of conceptually related courses suitable for the field of instruction and individual career objectives. The choice of courses must be approved by the faculty advisor and the department(s) offering courses.

This curriculum structure gives students an unusual opportunity to develop academic programs particularly suited to their needs. The core courses and the two advanced HSA courses provide students with generalist administrative competence; the nine fields of instruction offer a wide choice of areas in which to develop special expertise. In all but three fields of instruction, students have a choice concerning the amount of experiential learning they wish to include in their programs of study. This choice concerning the amount of field experience can affect the number of months required to complete the program; that is, for a full-time student the residency option will require 28 months, while the internship option will require 20 months.

### Fields of Instruction

An asterisk indicates that a 9-credit-hour administrative residency is required for that field of instruction.

#### MANAGEMENT OF ACUTE-CARE HOSPITALS\*

This field of instruction is designed to provide an understanding of the organization, management, and interrelationships of hospital clinical, support, and administrative functions, and analysis of systems and procedures used to provide short-term inpatient services. Students are also provided with a managerial background in the areas of health services policy-making, regulation, and legislation.



### MANAGEMENT OF LONG-TERM CARE SERVICES\*

This field explores a wide range of medical and support services required on a recurring or continuous basis by individuals who are unable to function independently because of chronic mental or physical impairment. These services are provided in a variety of settings, including homes for the aged, chronic care, rehabilitation or psychiatric hospitals, hospitals or homes for the mentally retarded and developmentally disabled, geriatric centers, and the client's home. The field also provides a management base in the areas of health services planning, policy-making, regulation, and legislation as applied to long-term care.

### MANAGEMENT OF AMBULATORY HEALTH SERVICES\*

This field addresses the critical need for managing the delivery of health and medical services to individuals who do not require the constant supervision associated with inpatient care and can either travel to the site where service is provided or be treated in their domicile. Although this definition includes such activities as individual practice of medicine, instruction will focus only on the management of services in organizational settings in which two or more individuals are engaged in delivering ambulatory care as a service offered by a formal organization. Examples of settings for ambulatory services are hospital outpatient departments, medical group practices, health maintenance organizations (HMOs), and public health center clinics. Ambulatory services administrators also work in the areas of health services planning, policy-making, regulation, and legislation.

### HEALTH INFORMATION SYSTEMS

This field is designed to provide an understanding of information systems as they are used in the administration of health services. The application of electronic data processing or computers to health care is stressed. Although some knowledge of programming languages will be necessary, the concepts of information and computer systems will be emphasized. Examples of the areas of application are medical records, program evaluation, community/national health statistics, financial management assessment, and productivity control.

### HEALTH SERVICES FINANCIAL MANAGEMENT

This field responds to a demand for a thorough understanding by the administrator of financial management in health institutions. The instruction includes managerial accounting, cost analysis, financial decision making, capital formation, and investment analysis, with specific adaptation to unique problems within the health care field.

### HEALTH SERVICES MATERIALS MANAGEMENT

This field explores the management of physical resources in health service institutions. The instruction focuses on the purchase and management of supplies and equipment, inventory management, contracting, cost allocation, plant operations, and facilities maintenance.

### HEALTH SERVICES POLICY, MARKETING, AND PLANNING

This field is designed for those who wish to focus on strategic planning and marketing of health care systems and health care institutions and on health policy development and analysis. An emphasis on policy skills will enable the



student to develop realistic and accurate statements of principles that can guide the health activities of governments, institutions, and other organizations. An emphasis on planning and marketing skills will enable the student to develop strategies based on values expressed by health services policies and to conduct marketing activities within health services organizations. Skills related to achieving acceptance of policies and implementation of plans will also be developed. The overriding concept is that of strategic health decision making in an atmosphere of systematic inquiry with an awareness of values.

#### HEALTH SERVICES AND OPERATIONS RESEARCH

This field deals with the application of research techniques and methodologies to the delineation of policy issues and the generation of solutions to problems in the organization, delivery, and financing of health services. Operations research is the application of mathematical techniques such as linear and nonlinear programming, queuing models, and simulation to develop solutions for operating and policy problems.

#### HUMAN RESOURCES MANAGEMENT

This field covers resources planning, allocation, utilization, and development and evaluation of health services personnel. Included are the various personnel functions, the development of personnel policies and procedures, employee and labor relations, and collective bargaining.

#### MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration degree program prepares students for professional careers not only in the public service (federal, state, and local) but also in organizations that require a knowledge of public policy and administration, such as public interest groups and research institutes. The 42-semester-hour program, outlined below, is intended to provide both a generic core for students and specialized elective fields tailored to the interests and career objectives of each individual student. The curriculum provides graduate instruction in all areas recommended by the Guidelines and Standards for Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour) core which includes courses in public administration and management, public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289, which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide a deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence. With the approval of a faculty advisor, the student may design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.



Because public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

### Required Courses

#### PUBLIC ADMINISTRATION REQUIRED CORE (24 semester hours)

- PAd 205 Introduction to Public Administration and Management
- PAd 295 Research Methods
- PAd 296 Statistical Applications in Public Administration
- PAd 261 Policy Analysis in Public Administration **or**
- PAd 260 Policy Formulation and Administration
- Mgt 210 Individual and Group Dynamics in Organizations **or**
- PAd 221 Organization Theory and the Public Sector
- PAd 252 Public Expenditure Analysis and Planning
- PAd 289 Public Program Management and Policy Implementation
- PAd 213 Administration in the Federal Government **or**
- PAd 245 Intergovernmental Relations

#### ELECTIVE FIELDS (12 semester hours—see below)

#### AMERICAN ADMINISTRATIVE INSTITUTIONS (3 semester hours)

Either PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments, is recommended as an introductory course. In some of the elective fields, either course may be counted as 3 of the 12 required semester hours.

#### ELECTIVE COURSES (6 semester hours)

#### Elective Fields

The nine elective fields offered within the Department of Public Administration are described below. Twelve semester hours are required for each field. In addition to the fields listed below, students may elect such other standard four-course fields as Business Economics and Public Policy, Organizational Behavior and Development, Information Systems Management, International Business, and Quantitative Analysis for Decision Making. Students may also take an approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification, specifying the courses to be taken, and submits it by petition through the faculty advisor.

#### BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

#### EXECUTIVE, LEGISLATIVE, AND REGULATORY MANAGEMENT

This field offers students the opportunity to develop an expertise in the management of federal government. It includes course work in the workings of the executive and legislative branches, with specific emphasis on the regulatory



process, the civil service, administrative law, and congressional oversight. Geared to midcareer managers as well as entry-level graduate students, this field gives special attention to the practical functions of public management: implementation, accountability, and effectiveness.

#### MANAGEMENT OF NATIONAL RESOURCES

This field is designed to provide advanced course work exclusively to senior military and civilian officers at the Industrial College of the Armed Forces. The field prepares these officers for assignments that will require them to work closely with the private and public sectors in national resources management at time of war, and it prepares them for professional careers in the public sector.

#### MANAGING IN PUBLIC ORGANIZATIONS

This field gives primary attention to the managerial processes by which organizations are structured and their work undertaken. It includes courses in organizational theory and large organizations but is also concerned with the management of governmental activities. It is for students who intend to pursue careers in public management.

#### MANAGING STATE AND LOCAL GOVERNMENTS

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

#### POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision making and develop abilities to analyze and evaluate these processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies or similar positions in research or consulting firms.

#### PROCUREMENT AND CONTRACTING

This field covers the many activities of government performed under contractual arrangements. Increasingly, public agencies find the most efficient, and often the only, method of meeting needs is through procurement action. This dimension of public administration is often subject to unique practices and regulations and requires the acquisition of specialized knowledge and skills in the processes of procurement and contracting. This elective field, offered jointly with the Department of Business Administration, promotes a better understanding of public-private interactions in procurement activities.

#### PUBLIC HUMAN RESOURCES ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating in this field typically work in human resources administration at some level of government.



## TELECOMMUNICATIONS MANAGEMENT

This field is designed for public managers who will find it valuable to understand the various capabilities of telecommunications to organize and utilize information within an organization, to appreciate the policy issues involved in the regulation of telecommunications, and to be conversant with the terminology and structures of telecommunication systems.

### Internships

Students with little or no professional experience are strongly encouraged to take an internship during the degree program. There are many opportunities in the Washington area for intern experiences in federal agencies, county and city government agencies, and the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid and may be taken for credit or not for credit. To receive academic credit, students must have completed 9 credit hours in the degree program. In general, internships for credit involve 15-20 hours of work per week for 14 weeks. Also, see Government Intern Scholarship Program under Special Programs, below.

## MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems.

The program consists of 51 semester hours of course work and a comprehensive examination. Course work includes 21 hours of undergraduate prerequisites and 30 hours of graduate courses, including 6 hours of electives. Prerequisites may be waived if comparable work has been taken at GWU or at a regionally accredited college or university, provided a grade of C or better was earned in prerequisite courses. A cumulative quality-point index of 2.5 must be maintained in all prerequisite courses.

### Degree Requirements

1. Twenty-one semester hours of prerequisite courses or equivalent as follows:
  - a. An introductory computer course involving programming (e.g., FORTRAN, BASIC, or PASCAL).
  - b. Two additional advanced programming courses covering at least one additional programming language (e.g., PL/1, COBOL, or C). COBOL is strongly suggested as one of the languages.
  - c. Two additional advanced undergraduate courses in areas such as assembly language programming, computer systems architecture, data structures, systems analysis, operating systems, data communications, or database systems.
  - d. Two semesters of undergraduate mathematics comparable to Math 31 and 32, or 51 and 52.
2. Completion of 30 semester hours of graduate course work with a quality-point index of 3.0, including the following courses plus 6 semester hours of electives:

Mgt 220	Operations Research in Decision Support Systems
Mgt 280	Information Systems Development and Application
Mgt 282	Information Systems and Telecommunications
Mgt 283	Topics in Higher-Level Languages
Mgt 284	Database Systems



- Mgt 286 Operating Systems
- Mgt 287 Design of On-Line Information Systems
- Mgt 288 Applied Artificial Intelligence Programming or
- Mgt 290 Special Topics in Management Science
- 3. Successful completion of a written Master's Comprehensive Examination.

### MASTER OF TAXATION

The Master of Taxation degree is designed to prepare students for careers as professionals in public accounting, private industry, and government. The program of study provides a thorough understanding of the tax laws and their application. It also supplies the necessary foundation for a broad appreciation of the business environment.

The program consists of 60 semester hours of course work, of which 27 hours may be waived if comparable study has been completed prior to admission. Sixty semester hours of the minimum program of 33 hours of course work may be awarded as advanced standing.

The program of study consists of two levels.

#### *First Level: Common Body of Knowledge Courses (30 semester hours)*

Accy 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270.

These courses must be completed prior to enrollment in Second-Level courses, except Accy 297, which must be taken in the last semester of the program. All of these courses, except Accy 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

#### *Second Level*

##### *1. Required Courses (21 hours)*

Accy 225, 261, 262, 263, 264, 265, 269 (Accy 225 may be replaced by another graduate-level accountancy course if the student has successfully completed comparable work at another regionally accredited institution.)

##### *2. Electives (9 hours)*

Elective courses are to be selected in consultation with the designated faculty advisor.

##### *3. Required Common Body of Knowledge Course (3 hours)*

This course, Accy 297, is a required capstone course. It must be taken in the last semester of the program.

### MASTER OF URBAN AND REGIONAL PLANNING

The Master of Urban and Regional Planning is a professional degree program designed as preparation for a broad range of professional careers in both the private and public sectors. The 50-semester-hour course of study provides a broad education to develop competence in planning theory and methodology and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Emphasis is placed on the formulation of realistic planning solutions and the practice of urban and regional planning.

The degree is awarded by vote of the faculty after satisfactory completion of the following requirements.

1. Three semester hours of macroeconomics completed at a regionally accredited college or university prior to admission or within the first two semesters of the program.
2. The core courses, consisting of 32 semester hours:
  - U&RP 201 Planning Theory and Practice I
  - U&RP 202 Planning Theory and Practice II
  - U&RP 203 Principles of Community Planning and Design
  - U&RP 207 Land Development Planning
  - U&RP 208 Land Use and Urban Transportation Planning



- U&RP 210 Urban Development Economics
- U&RP 211 Methods of Urban and Regional Analysis I
- U&RP 212 Methods of Urban and Regional Analysis II
- U&RP 215 Advanced Planning Problems
- U&RP 218 Metropolitan and Regional Planning

3. A field of concentration, with a minimum of 9 semester hours.
4. Six semester hours of elective courses.
5. A minimum of three months full-time (or equivalent) supervised professional work experience in planning, with an acceptable written report approved by faculty advisor.
6. A written Master's Comprehensive Examination following completion of all course work.
7. A thesis (3 semester hours) based on the candidate's research; the thesis usually complements the chosen field of concentration.

While the typical program of study, including the thesis, comprises 50 semester hours, requirements may be reduced to a minimum of 45 semester hours, depending upon the student's background and professional experience.

### Fields of Concentration

Each student is required to develop a field in an area of professional specialization. A field must consist of a minimum of 9 semester hours, including a required two-course sequence. The two courses include the field's theories, concepts, and methods and their synthesis and application by means of case studies and projects. Instruction is available in the following fields.

#### HOUSING AND COMMUNITY DEVELOPMENT

The fundamental elements of community development are explored in this field, including housing, community facilities, fiscal policy, urban economics, and neighborhood dynamics. Emphasis within the courses of instruction is on problem identification and analysis and on plan and program formulation. Specialization in this field provides excellent preparation for professional planning positions in the public and private sectors.

#### COMMUNITY PLANNING AND DESIGN

The field of community planning and design is concerned with improving the relationship between people and the environment. From an understanding of users' needs and perceptions, students develop and apply their aesthetic sensibilities and creative skills in problem solving. The process, theory, principles, and techniques of community design form the basis for preparing and testing plans that are physical manifestations of a community's goals and aspirations. The field prepares students for applying this "social art" in a wide range of public and private planning positions.

#### HISTORIC PRESERVATION

This program is designed to foster an understanding of the historic attributes of architecture and landscape, from the extraordinary monument to the most ubiquitous of patterns; developing skills to document, assess, and protect our historic legacy; and acquiring a sensitivity to design and planning issues central to managing the forces of growth and change within a historic context. Preservation is examined as process, involving a wide range of participants, that can vary in complexion, focus, and concrete goals. The ability to solve problems in preservation is emphasized over any set of administrative or political procedures.



### SPECIALIST IN HEALTH SERVICES ADMINISTRATION

Students with a master's degree in an approved related field or with a master's degree and managerial experience may undertake studies leading to the degree of Specialist in Health Services Administration. This program serves people who plan to begin a career in management, policy-making, or planning in the field of health services or who wish to supplement previous graduate study in health services administration.

Most students with adequate preparation in health services administration or a related management field should be able to complete the requirements by undertaking a 30-semester-hour program of study. Those lacking specialized preparation will need additional course work, depending on career goals. Field experience assignments, if required, are in addition to the 30-semester-hour minimum.

Individual programs will be developed in consultation with a faculty advisor on the basis of the student's educational background, experience, and specific professional objectives.

All students must take at least one doctoral-level seminar in health services administration (HSA 310 or 330) and complete a 3-semester-hour research project (HSA 270). The remaining hours may be taken in health services administration or other appropriate disciplines.

### DOCTORAL PROGRAM

The degree of Doctor of Philosophy is offered in accountancy, business administration, health services administration, information and decision systems, management and organization, and public administration. The Committee on Doctoral Studies supervises all aspects of the program.

#### Admission

The minimum admission requirement is a bachelor's degree from a regionally accredited college or university, preferably with a major appropriate to the proposed field of study. Most applicants have completed a master's degree in an appropriate field. Applicants whose degrees are in fields other than their proposed field of study are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are required to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Applicants whose test scores are more than five years old are encouraged but not required to take or retake either of the tests. Arrangements to take the tests must be made with the Educational Testing Service. Students whose native language is not English must also submit the Test of English as a Foreign Language (TOEFL) scores with a total score of not less than 550.

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

Admission to the doctoral program is granted for the fall semester and summer sessions only. Completed applications must be sent to the Office of Enrollment Development and Admissions, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the



fall semester and summer sessions. Applicants are notified of their eligibility for admission four to five weeks subsequent to established dates for receipt of the completed application and all required supporting credentials.

### Plan of Study

The doctoral program consists of two major parts: the pre-dissertation stage and the dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the primary and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution, either applied or theoretical, to the existing body of knowledge. The total program must be finished in seven years; only under very special circumstances can extensions beyond this time limit be given by the Committee on Doctoral Studies. If a student is granted an extension beyond the seventh year (14 semesters), the student must register and pay for 3 credit hours of Dissertation Research at the then-current tuition rate every semester until graduation.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of the primary and supporting field advisors during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the primary field of study, must include in their study plan Mgt 390, Philosophical Foundations of Administrative Research, and the multidepartmental course, 311, Seminar: Public-Private Sector Institutions and Relationships. These courses should be taken during the first academic year after admission. Mgt 391, Methodological Foundations of Administrative Research, must be taken at the end of course work.

In addition to the evaluation methods proposed in the study plan, the primary and supporting field advisors evaluate the student's progress at the end of the first and second semesters after admission, and thereafter at the end of the spring semester of each academic year. A comprehensive evaluation of study plan activities for both the primary and supporting fields is the final process of the pre-dissertation stage.

As background, a student whose field is designated as Business Administration must demonstrate, either through prior academic experience or through the proposed content of the doctoral study plan, a working knowledge of the principal content areas of business administration.

Supporting fields may be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the Handbook on the Doctoral Program, available in the Doctoral Program Office.

### SPECIAL PROGRAMS

#### International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.



It is also equipped to enter into arrangements with principals of hospital systems in worldwide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

### Joint Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and the Master of Business Administration or Master of Public Administration in the School of Government and Business Administration. Students must be admitted separately both to the National Law Center and to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

### Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs. The *Certified Public Purchasing Officer* (CPPO) is administered by the National Institute of Governmental Purchasing, 115 Hillwood Ave., Falls Church, Va. 22046; the *Certified Professional Contracts Manager* (CPCM) is administered by National Contract Management Association, 6728 Old McLean Village Dr., McLean, Va. 22101; the *Certified Purchasing Manager* (CPM) is administered by the National Association of Purchasing Management, 496 Kinderkamack Rd., P.O. Box 418, Oradell, N.J. 07648.

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Dean M.A. East

Associate Dean H.R. Nau

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Professorial Lecturers E.G. Griffin, K.S. Flamm, J. Schlicht  
Associate Professors C.J. Allen, M.A. Atkin, E. Berkowitz, M.D. Bradley, Chaves, C.J. Deering, C.F. Elliott, H.B. Feigenbaum, J. Henig, C.J. Herber, W. Johnson, C.C. Joyner, Y.K. Kim-Renaud, J.H. Lebovic, D.L. Lee, G. Ludlow, Y. Olkhovsky, R.W. Rycroft, S.C. Smith, M. Sodaro, H.S. Watson, S. Wolchik, R.Y. Yin



Adjunct Associate Professor M.B. Wallerstein  
Associate Professorial Lecturers S.E. Johnson, G.R. Kieval  
Assistant Professors H.L. Agnew, N.J. Brown, M.D. Moore, J.P. Rogers, G.C.Y. Wang  
Assistant Professorial Lecturer G. Sandles

#### **Committees\***

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##### **COMMITTEE ON APPOINTMENTS, PROMOTIONS, AND TENURE**

W.R. Johnson (Chair), M.F. Gordon, O. Havrylyshyn, H. Nau, B. Sapin

#### **INTRODUCTION**

The Elliott School of International Affairs offers graduate and undergraduate programs to prepare individuals for an increasingly international and multinational environment. The historical roots of the Elliott School can be traced back to the establishment of the School of Comparative Jurisprudence and Diplomacy in 1898. In 1966, the School separated from the School of Government, Business, and International Affairs to become an independent unit, the School of Public and International Affairs. In 1987, the name was changed to the School of International Affairs, and in 1988 the School was renamed in honor of Evelyn E. and Lloyd H. Elliott, the President of George Washington University from 1965 to 1988.

#### **Academic Programs**

The Elliott School has undergraduate and graduate programs in international affairs, Latin American studies, and East Asian studies; an undergraduate program in Middle Eastern studies; and graduate programs in Russian and East European studies, security policy studies, and science, technology, and public policy. Programs are multidisciplinary and emphasize both domestic and foreign governmental policy. Course offerings draw heavily on the various academic departments of the University.

Undergraduate programs are designed to foster a liberal education that focuses on a solid understanding of major historical and contemporary issues in international affairs. The programs tend to have a broader base than a major in a traditional academic discipline.

Graduate programs lead to the degree of Master of Arts. Students develop a higher level of competence in a world region or a discipline in preparation for professional employment in government or in international organizations, agencies, or business.

#### **REGULATIONS**

See Admissions; Registration; Fees and Financial Regulations; Regulations.

##### **Attendance**

Students are held responsible for all of the work of the courses in which registered, and all absences must be excused by the instructor before provision is

\* The Dean of the School is an *ex officio* member of all committees.



made to make up the work missed. A student suspended for any cause may not attend classes during the period of suspension.

### Withdrawal

Withdrawal without academic penalty after the end of the fifth week of class (fall or spring semester) is permitted only in exceptional cases (see Withdrawal page 47).

## THE DEGREE OF BACHELOR OF ARTS

The Elliott School offers programs leading to the degree of Bachelor of Arts in the fields of international affairs, East Asian studies (China or Japan), Latin American studies, and Middle Eastern studies.

### ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units,\* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra.

2. The principal's statement that the applicant is prepared to undertake college work.

3. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test, or on the American College Testing battery.

It is recommended that the College Board examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, NJ 08541-6200, not less than one month before the date of the tests. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Consideration can be given to the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all the requirements stated here. Appropriate scholastic aptitude tests may be prescribed.

### Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University are as follows. Applicants who have accumulated at least 30 semester hours (or the

\* A unit represents a year's study in a secondary school subject, including in the aggregate less than 120 sixty-minute periods, or the equivalent, or prepared classroom work.



equivalent) of academic credit at another regionally accredited college or university may be admitted to the Elliott School of International Affairs as transfer students with advanced standing. Those who have achieved a quality-point index of at least 3.0 on a 4.0 scale in previous college work will be given preference for admission. Applicants who have completed fewer than 30 semester hours of acceptable credit must meet entrance requirements for freshmen.

Advanced standing may be awarded for properly certified courses for which the student received a grade of C or above, provided that such courses are comparable to the curriculum requirements for the degree sought in the Elliott School. In the case of course work completed at a two-year college, no more than 66 semester hours of credit may be applied as advanced standing toward a degree in this School.

Although a grade of D in a course is not acceptable for transfer, the course may satisfy a curriculum requirement. Credits earned with a grade of D will not, however, be assigned as advanced standing.

The Elliott School reserves the right to refuse credit for transfer in whole or in part or to accept credit provisionally.

It is the responsibility of the student to have an official transcript from each institution formerly attended sent directly to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Students wishing to transfer from another division of the University into a degree program in the Elliott School must submit to the Office of Admissions a formal application for transfer and must be in good academic standing with a cumulative quality-point index of 2.5 or above at the time of transfer. A maximum of 45 semester hours earned as a nondegree student in the Division of Continuing Education may be applied toward a degree in this School.

All transfer students must satisfy the residence and course requirements for degrees awarded by the Elliott School.

## GENERAL REQUIREMENTS FOR THE DEGREE

### Academic Work Load

The normal academic work load for a full-time student is 15 semester hours. A full-time student not on probation may take a course load of up to 17 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean. Students on probation are limited to 13 hours.

### Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in exercise and sport activities cannot be included in the required hours); and (2) a cumulative quality-point index of at least 2.0.

### DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index in course work is placed on the Dean's Honor List for that semester. Appearance on the list is limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.



## ACADEMIC STANDING

A student whose cumulative quality-point index (QPI) is less than 2.0 but at least 1.0 any time after having enrolled in a minimum of 24 semester hours is placed on probation: "First Probation" for the initial semester, "Second Probation" if continued on probation for a second semester. For part-time students and those enrolled in summer sessions, a "semester" is interpreted to mean a time interval in which at least 12 semester hours have accrued. A student on probation is limited to no more than 13 semester hours of course work per semester.

A student who resumes a cumulative QPI of 2.0 or more after a first or second semester on probation is removed from probationary status. Failure to resume a cumulative QPI of 2.0 after two successive semesters on probation results in suspension. The Dean's Council may continue a student on probation if satisfactory progress is demonstrated during the probation period.

A student whose cumulative QPI falls below 1.0 any time after having enrolled in a minimum of 24 semester hours as a student in the Elliott School will be suspended.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. A student suspended twice for poor scholarship will not be readmitted.

## INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades I (Incomplete) or W (Authorized Withdrawal) may be assigned are described under Regulations.

*Changing an Incomplete*—The grade of I must be changed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of I is assigned. An Incomplete that is not changed within this period automatically becomes an F. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of I cannot be changed by registering for the course here or by taking its equivalent elsewhere.

## Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the Elliott School of International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the Elliott School.

## Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.



### Internships

Internships offer students the opportunity to make practical use of the knowledge they acquire in the classroom. Undergraduates who have completed at least 30 credit hours are eligible to arrange internships for credit. Academic work in the field of the internship is required.

Internships are available in the private and public sectors. Students are responsible for locating their own internships; listings are posted in the GWU Career Services Center.

### Regulations on Study Abroad

Students are encouraged to travel and study abroad. Those wishing to study abroad must consult their academic advisor and the study-abroad advisor. Students must secure the dean's prior approval for any plan of study abroad if the credit earned is intended to apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program must be presented for consideration together with detailed descriptions of the courses to be taken. See Study Abroad Programs, under Special Programs, page 168.

### Pass/No Pass Option

A student in the Elliott School of International Affairs who has a cumulative quality-point index of 2.5 or better may, with the approval of an advisor and the dean, take one course per semester and receive a grade of P, Pass, or NP, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of P or NP is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second semester of enrollment in the University. Students in the School of International Affairs may take no more than six courses in which the grade of P or NP is assigned, including those in which the grade of P or NP is normally given and those taken in any other college, school, or division of the University prior to transferring to the Elliott School.

### Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores, petition the dean of the Elliott School of International Affairs for admission to a special 90-semester-hour degree program. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the beginning of the junior year.

The basic assumption of this program is that the student can waive at least 30 semester hours of freshman or introductory requirements.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of A in 50 percent of the total course work and in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).



3. The 90 semester hours of credit must be earned in actual course work. Credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

### Earning Credit or Waiving Requirements by Examination

For information on earning credit by examination or waiving curriculum requirements, see your academic advisor in the Elliott School.

### CURRICULUM REQUIREMENTS

Curriculum requirements for the first two years are outlined below. Requirements for majors in international affairs, Latin American studies, and East Asian studies (China or Japan) are outlined under the appropriate heading in Courses and Instruction. See your academic advisor in the Elliott School for requirements for majors in Middle Eastern studies.

English:	Engl 9 or 10, and 11 or 12 .....
Humanities:	AmCv 71-72; Art 31-32 or 71-72; Clas 108, 113; *literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 1-2 .....
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish .....
Math/Science:	BiSc 3-4 or 11-12; Chem 3-4 or 11-12; Geol 1-2; Math 9 and 10 or 30 and 31; Phys 1, 2, 5, and 6, or 9-10; Stat 51, 53, or 91, and 105 or 129; 129, 130; 111, 112 .....
Social Science:	Econ 1-2; Hist 40 and 72; PSc 1, 2 .....
‡Elective:	.....
Total	.....

### SECONDARY FIELDS OF STUDY

Students can take a secondary field of study, such as business, economics, languages, in other schools of the University. Students from other schools of the University can take a secondary field of study in International Affairs in the Elliott School of International Affairs. See the brochure *Secondary Fields of Study* available in the Student Services Office.

### THE DEGREE OF MASTER OF ARTS

The Elliott School offers degree programs leading to the Master of Arts in the fields of East Asian studies, international affairs, Latin American studies, Religion, and Women's Studies.

\* If a student elects 6 semester hours of literature in any foreign language, this cannot be used to satisfy the language requirement.

† Chin 5-6 is required for East Asian studies (China focus) majors; Japn 3-4 is required for East Asian studies (Japan focus) majors. Greek and Latin are not acceptable for international affairs majors. Latin American studies majors must include Spanish.

‡ Credit is not given for exercise and sport activities courses.



sian and East European studies, security policy studies, and science, technology, and public policy.

### ADMISSION REQUIREMENTS

Application forms are available from the Office of Graduate Admissions, Elliott School of International Affairs, George Washington University, Washington, D.C. 20052. Admission is normally for the fall semester only and may be for full- or part-time study. Admission decisions are made on a rolling basis, beginning in late February. Applications for admission must be submitted by February 1 for the following fall semester. January 15 is the deadline for applicants for fellowship awards and for admission applications from international students.

In selecting applicants with the best prospects for success, the Admissions Committee is most interested in the following: a bachelor's degree from an accredited college or university; a B average or better in a relevant undergraduate major; scores on the general test of the Graduate Record Examination (60th percentile or higher on the verbal, quantitative, and analytical sections); strong letters of recommendation; and a concise and pertinent essay.

**International Affairs**—The applicant's undergraduate program should include background courses corresponding to the undergraduate major in international affairs at this University or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

**East Asian Studies**—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

**Latin American studies**—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American studies at this University, or equivalent. Majors in other fields may be considered for admission provided that undergraduate course work includes Spanish or Portuguese and sufficient course work in one of the following areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

**Russian and East European Studies**—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1-2 and 3-4, or 5-6.

**Science, Technology, and Public Policy**—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

**Security Policy Studies**—An undergraduate background similar to that specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

### Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school.



## GENERAL REQUIREMENTS

Programs leading to the Master of Arts degree vary in their requirements. Some programs offer an option that requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for 6 semester hours of thesis research (IAff 299-300). Other programs require a minimum of 36 semester hours of graduate course work and may include a thesis. The Security Policy Studies program does not have a thesis option; the Chinese language and literature concentration of the East Asian Studies program requires the thesis option. Under all programs, course work is taken in order to prepare for the Master's Comprehensive Examinations.

Candidates for the degree of Master of Arts are required to submit an advisor-approved plan of studies (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester of residence. Master's degrees are awarded by vote of the faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examinations.

Under special circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor, and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than 6 semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than 9 semester hours may be taken for graduate credit in the 36-semester-hour program. (An exception to this rule is the case of students who select one or more fields in history; they may take 9 hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All master's degree candidates must complete degree requirements within five years of their admission to the program. A student who is unable temporarily to continue the plan of studies may request a leave of absence not to exceed one year. Extensions beyond the five-year period may be granted in exceptional circumstances, but the student will be required to register and pay for 6 credit hours of Reading and Research each semester.

No credit is granted for work done in absentia or without formal instruction except for the thesis, which may be completed in absentia with the permission of the curriculum advisor and the dean. No more than 6 semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

## Curriculum Requirements

Curriculum requirements for the master's programs are listed under the appropriate heading in Courses of Instruction—International Affairs; East Asian Studies; Latin American Studies; Russian and East European Studies; Science, Technology, and Public Policy; and Security Policy Studies.

## Tool Requirements

In most degree programs, a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the relevant language department)



ment) of a modern foreign language that has an appropriate literature for the study of the field. Students in regional programs must demonstrate their ability in a language appropriate to the study of the specific region. If a student selects a language not offered by the University, a testing fee of \$50 will be charged in order to compensate an outside examiner. A master's degree candidate whose native language is not English may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the fields of security policy studies and science, technology, and public policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency (i.e., grades of B or better) at the level of Stat 105, 112, 183, or 197. The tool requirements of the science, technology, and public policy field may also be fulfilled by proficiency in PAD 296.

Candidates in international affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times. Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree, nor may they be taken on a Pass/No Pass basis.

### Master's Comprehensive Examinations

In addition to course examinations, the candidate must pass written Master's Comprehensive Examinations covering the chosen fields of study. Examinations are scheduled twice a year (in November and April) and should be taken during the last semester of course work or shortly after the completion of all prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. It should be understood that course work constitutes only partial preparation for the Master's Comprehensive Examinations. Each student is expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. A student who fails to pass any part of the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

### Scholarship Requirements

Grades for graduate work are A, Excellent; B, Good; C, Minimum Pass; F, Fail; CR, Credit; I, Incomplete; IP, Progress; W, Authorized Withdrawal; and Z, Unauthorized Withdrawal.

Graduate students are required to maintain a minimum cumulative quality-point index (QPI) of 3.0. Students whose cumulative QPI falls below 3.0 at any time after having completed at least 9 semester hours will be given an additional semester in which to raise the QPI above 3.0. Those who fail to bring their QPI over 3.0 at the end of the additional semester will not be allowed to continue in the program. For part-time students and those enrolled in summer sessions, a semester is interpreted to mean a time interval in which at least 9 semester hours have accrued.



A master's candidate who receives a grade of F is required to present cause for consideration by the Dean's Council as to why he or she should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol I (Incomplete) or (Authorized Withdrawal) will be recorded. The symbol I indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an Incomplete cannot be made up after the lapse of one calendar year. An Incomplete that is not made up by the end of one calendar year remains as a grade of I on the student's record. An Incomplete cannot be removed by reregistering for the course. No student will be permitted to register for courses or take the Comprehensive Examinations if there are more than two Incompletes outstanding on the record.

A student who fails to meet the established deadlines for completion of course work or other elements of the program (e.g., comprehensive examinations) and is granted an extension may be required by the dean and the Dean's Council to register for 3 credit hours of graduate Reading and Research for each semester that the work is delinquent.

### The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (IAff 299-300) until the thesis subject has been formally submitted to the dean's office. Some programs, such as international affairs, set specific requirements in order to qualify to write a thesis. The subject must be approved by the member of the faculty under whom the thesis is to be written, a second member of the faculty who will serve as a reader, and the student's program director. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the University Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the dean's office.

Payment of tuition for thesis research entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment and is allowed one calendar year to complete it. If the preparation of the thesis extends beyond the additional calendar year, the student must reregister for the entire 6 hours of thesis again and pay tuition as for a repeated course.

## SPECIAL PROGRAMS

### Joint Master of Arts and Juris Doctor Degree Program

The Elliott School of International Affairs cooperates with the National Law Center in offering a program of study leading to the degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the Elliott School and the National Law Center. Applications should be made separately but at the same time. Both the Elliott School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the Elliott School for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of course work for the Juris Doctor degree must be taken as a unit.



The Master of Arts degree program normally consists of the 30-semester-hour program that includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to 6 semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the Elliott School and the National Law Center and must maintain this concurrent registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

#### **Institute for Sino-Soviet Studies**

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the Elliott School of International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe, and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, and political science. Research work is integrated with the teaching program.

The Institute's offerings are intended especially for students preparing for the Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies, or in the fields of economics, history, or political science, with specialization in Sino-Soviet studies.

Doctoral candidates in political science will take their Sino-Soviet work in the form of appropriate subfields in preparation for the general examinations in their discipline; doctoral candidates in history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences. Consultative committees designated by the Graduate School direct the work of each student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. Language requirements will depend upon the discipline of concentration. Candidates should consult the department in which they are taking their degree.

#### **Center for International Science and Technology Policy**

The Center, established in 1970 as the Graduate Program in Science, Technology, and Public Policy, has become a locus for the exchange of information and ideas. In addition to overseeing the M.A. program in this area, the Center organizes seminars and meetings, sponsors research, and hosts visitors from elsewhere in the United States and abroad. Recent seminar speakers have included science advisors to the President and the chairman of the House Committee on Science and Technology.

#### **Space Policy Institute**

The George Washington University established the Space Policy Institute as a center of objective competence in an important area of national and international activity. The Institute focuses on policy issues related to civilian space



activities and their interactions with national security space programs. It conducts research on space policy issues and organizes seminars, symposia, and conferences.

### Study Abroad Programs

Study abroad programs for the academic year are currently available in England, France, Germany, Japan, China, and Peru. Students who wish to study in countries not mentioned here should check with the office of the dean. Credits earned with acceptable grades are transferable toward the appropriate degree at George Washington University, provided there is no duplication of work done previously. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. Information may be obtained from the Study Abroad Office, Stuart Hall, Room 101.

Study abroad is available at varying locations during the summer. Information on summer programs abroad is available in the GWU Summer Sessions Announcement and through the Division of Continuing Education.

## DIVISION OF CONTINUING EDUCATION

Dean C.D. Holden

Associate Dean G.E. Jones

Assistant Deans B.J. Moreland, G.E. Schou, R.H. Shumaker, A.O. Smith

### INTRODUCTION

The Division of Continuing Education provides credit courses and continuing education programs by administering the off-campus programs of the college and schools of the University. The Division also sponsors noncredit courses, conferences and institutes, and seminars and workshops, as well as several certification programs to meet the personal and continuing professional education needs of adults. Special programs of study may be developed in response to specific needs of the government and business communities. The Division includes a center designed to improve the flow of science communications information. The staff of instruction for Division programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the professional community.

The Division works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study for continuing education students. In cooperation with sponsoring groups from government and business, the Division offers courses at its recently expanded Crystal City Education Center in Arlington, Virginia, and other off-campus locations in the District of Columbia and suburban Maryland and Northern Virginia. The Division also offers, through its Tidewater Center, graduate degree programs in various disciplines at locations in the Hampton, Norfolk, and Virginia Beach area. A wide range of conferences, seminars, and



workshops is available to organizations and individuals from the professional community.

Any organization interested in having the Division organize and conduct a course or a comprehensive educational program should contact the Dean of the Division of Continuing Education.

The academic standards of the University are maintained in off-campus credit courses. The Division of Continuing Education is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. All programs offered through the University's off-campus programs and administered by this Division are approved through the procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree-granting schools and colleges of the University. Credit earned through off-campus study conforms to academic standards throughout the University. All Division off-campus offerings in Maryland are approved by the Maryland State Board for Higher Education; those in Virginia are approved by the Commonwealth of Virginia Council of Higher Education.

Except as outlined below, all general University regulations apply to students in the Division of Continuing Education. In addition, Division students may be subject to special requirements of the school or college through which they are taking courses.

#### **ADMISSION AS A DEGREE CANDIDATE IN OFF-CAMPUS PROGRAMS**

Students wishing to be admitted as candidates in an off-campus degree program may obtain application forms from the school concerned, the Division of Continuing Education, one of the University's off-campus representatives, or the education officer of their agency or installation.

#### **NONDEGREE STUDENTS**

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. Formal University admission is not required at the time of registration in off-campus courses.

#### **CHANGES IN PROGRAM OF STUDIES**

**Dropping an Off-Campus Course**—A student may drop a course without academic penalty during the first third of the semester (first through fourth class meetings) by completing an Off-Campus Change Slip that has been signed by the instructor and submitting it to the appropriate University representative. Withdrawal from a course without academic penalty after this period requires approval of a written request accompanied by the completed change slip and submission to the appropriate dean.

A student must follow these procedures in order to drop any course. Notifying the instructor of the intention to drop a course does not constitute an official withdrawal. The instructor indicates on the change slip whether the student is passing. The effective date of withdrawal and decisions regarding refunds are determined by the appropriate dean. Failure to follow the proper procedure results in the recording of a failing grade and, regardless of the time of discontinuance, does not relieve the student of financial responsibility for the entire course. Off-Campus Change Slips may be obtained from the instructor, installation education office, or the Student Services office of the Division of Continuing Education.



## DEGREE PROGRAMS

The following degree programs are offered off campus.

### Graduate School of Arts and Sciences\*

*Master of Arts* with fields and concentrations in administrative sciences, crime in commerce, criminal justice, legislative affairs, security management, telecommunications

*Master of Forensic Science*

### School of Engineering and Applied Science†

*Master of Engineering Administration*

*Master of Science* with major fields in electrical engineering (communications), computer science, information management, operations research

*Professional Degrees (Engineer and Applied Scientist)*

### School of Education and Human Development‡

*Master of Arts in Education and Human Development* with major fields in curriculum and instruction, early childhood special education, higher education, human resource development, supervision and human relations, transitional special education

*Master of Education* with a major field in secondary education

*Education Specialist* with major fields in administration, higher education, human resource development

### Elliott School of International Affairs\*

*Master of Arts* with major fields in security policy studies, Russian and East European studies

## DIVISION PROGRAMS

The Division of Continuing Education administers off-campus degree programs and the activities of the Center for Career Education and Workshops, the Office of University Students, the Office of Conferences and Institutes, and Science Communication Studies.

### CENTER FOR CAREER EDUCATION AND WORKSHOPS (CCEW)

CCEW provides a broad spectrum of services focusing on innovative, nontraditional, career-oriented education. Among CCEW programs are noncredit, graduate-level career certificate programs to prepare the legal assistant, publication specialist, landscape designer, fund raising administrator, administrative manager, association executive, information systems specialist, public relations professional, and Washington representative. Other programs are designed to prepare the certified employee benefit specialist, certified financial planner, and credit administrator. Credit courses and test review courses (for CLEP, EIT, FSE, GMAT, GRE, LSAT, MAT, MCAT, and Basic Real Estate) are offered as well.

Workshops and short-term courses provide the opportunity for individuals to be informed of the innovations in their fields. Courses focus on advances in computer technology and train participants to increase personal effectiveness, improve managerial expertise, reinforce leadership ability, identify practical decision-making skills, broaden understanding of systems and concepts, and develop understanding of financial, political, and social strategies. The Profes-

\* For program information, see the field concerned under Courses of Instruction.

† See the School of Engineering and Applied Science Bulletin.

‡ For program information, see the section of this Bulletin on the School of Education and Human Development.



sional Development Program, designed to enhance the skills, productivity, and job satisfaction of an organization's employees, can provide these workshops, credit courses, and noncredit courses on site or through interactive television.

CCEW offers four undergraduate certificate programs that combine academic credit courses offered by Columbian College of Arts and Sciences with skill development workshops. The programs include Supervisory Specialist, Communication Studies, and Computer and Information Systems.

The Center is the site of the University's Continuing Education for Women (CEW) program, which has provided counseling and educational services to women in transition since 1964. Participants benefit from many CEW programs, which currently include group and individual counseling services accredited by the International Association of Counseling Services, Inc. CEW also offers a series of special-interest courses focusing on issues confronting women. For a complete listing of services, courses, and programs, see the CCEW schedule of classes.

### OFFICE OF UNIVERSITY STUDENTS

The Office of University Students (OUS) makes on-campus credit courses available to those who are not currently degree candidates at this University. Such students, often employed in government or industry, may be taking courses to enhance their career potential or as a matter of personal interest. They may be candidates for higher degrees at other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and those in the Departments of Accountancy, Business Administration, and Management Science are open to OUS students, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the School of Engineering and Applied Science Bulletin.

Registration in a given course may be denied OUS students when space is needed for degree candidates. OUS students are not eligible to register for thesis or dissertation research nor for continuous enrollment or leave of absence. OUS requires a minimum registration of 3 semester hours per semester or session, except in special circumstances as approved by the dean.

### Entrance Requirements

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission for one calendar year after the effective date of the suspension. An applicant who has been denied undergraduate admission within this University will not be considered for admission as a nondegree student for the same semester for which the application was denied.

Applications for admission through OUS for a fall or spring semester should be received in the Office of Admissions no later than the Friday before the first day of registration (see the Calendar, pages 5-7). Applications for admission for the summer should be submitted at least two working days prior to registration day. In both cases, however, applicants are urged to apply earlier. There is no application fee. For admission requirements for students from foreign institutions, see pages 24-25.



### Regulations

See Admissions, Registration, Fees and Financial Regulations, and Regulations. Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance and withdrawal (pages 45 and 47). The following specifically apply to all students registered through OUS:

Last day to add a class for credit—end of second week of classes.

Last day to drop a class for credit or to withdraw from the University—end of the seventh week of classes.

Equivalent amounts of time apply to the summer sessions.

### ACADEMIC WORK LOAD

For OUS students, the normal academic work load during the regular academic year is not more than 10 semester hours for a student employed more than 20 hours per week and not more than 18 semester hours for a full-time student. During the summer a student may take a maximum of two courses during any one session. Exceptions to these limits must be approved by the dean.

### SCHOLARSHIP REQUIREMENTS

A student who fails to maintain the scholarship requirements of OUS may be dismissed from the University. A statement of scholarship requirements is available in the office of the dean. All grades received in OUS remain on the record; scholarship requirements are based on the total record.

Grades—See page 45. There is no limitation on the number of courses that may be taken on a pass/no pass basis in OUS; however, there may be a limit on the number that can be transferred to fulfill degree requirements.

### INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of I (Incomplete) and W (Authorized Withdrawal) may be assigned are described on page 46.

*Changing an Incomplete*—The instructor normally sets a period (maximum of one year) within which the uncompleted work must be made up. An Incomplete that is not changed within one calendar year remains as a grade of I on the student's record.

### CHANGE IN PROGRAM OF STUDIES

*Change Within the Office of University Students*—A student may not change or drop courses (see Withdrawal, page 47) or change status to that of auditor except with the approval of the dean.

*Transfer Within the University*—Transfer to or from OUS may be made only with the approval of the deans concerned. Application for transfer to degree candidacy will be considered only after the completion of at least one semester in OUS or upon request from the college or school to which the student is seeking admission. Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the college or school concerning conditions to be met and the amount of work transferable.

### COLLEGE COURSES FOR SECONDARY SCHOOL STUDENTS

Under the auspices of the Office of University Students, well-qualified secondary school students may take college courses for credit in nondegree status at



George Washington University. During the academic year, high school juniors and seniors residing in the Washington metropolitan area may enroll in GWU courses as part-time, commuting students. Through the Summer Scholar Program, precollege students may enroll in a wide variety of summer courses prior to their junior or senior year of high school. Summer Scholars from outside the Washington area reside on campus in a University residence hall. Local residents may choose to use on-campus housing but are not required to do so. The Summer Scholar Program offers diversified cultural, social, and recreational experiences under the supervision of resident advisors.

**Scholarships**—Secondary school students with outstanding academic records and excellent scores on standardized tests will be considered for full-tuition scholarships. Because the awards are based on academic merit rather than financial need, only the application for admission and supporting credentials are required for consideration. The amounts awarded cover tuition only and cannot be applied to housing, meals, or fees.

For further information and an application, please write to the Coordinator, College Courses for Secondary School Students, Office of Admissions, George Washington University, Washington, D.C. 20052.

## **OFFICE OF CONFERENCES AND INSTITUTES**

Director Lu A. Kleppinger

The Office of Conferences and Institutes serves the University by planning, promoting, and administering conferences, institutes, and other noncredit activities cosponsored by the University's schools, academic departments, and centers or associations. Each event promotes the research, teaching, or public service activities of the faculty and/or the University. The Office of Conferences and Institutes provides budget planning, program development, marketing, and logistic support for eligible seminars, short courses, workshops, conferences, and institutes of all sizes, either on or off campus.

## **SCIENCE COMMUNICATION STUDIES**

Project Director F. Ronald Dutcher

The mission of Science Communication Studies is to improve the flow of scientific research information from those who generate it to those who apply it. Actively engaged in providing research and information services, SCS uses today's research tools—from conventional manual literature searches to computer systems—to collect, organize, analyze, and generate information. In addition, it develops new services and systems for access to technical literature in the biomedical and aerospace sciences. Activities include maintaining a database of publications related to space life sciences research; abstracting and indexing scientific literature; and preparing and publishing scientific manuscripts, bibliographic literature searches, critical analyses in life sciences, and newsletters. SCS educates and informs via publications, conferences, and other media; it does not offer courses.

## **NONCREDIT COURSES AND PROGRAMS**

In addition to the noncredit offerings of the Division, the University also offers a variety of noncredit professional development courses and programs through the School of Government and Business Administration (Continuing Professional Education Office), the School of Engineering and Applied Science (Continuing Engineering Education Program), and the School of Education and Human Development (Center for Research and Services).



## SUMMER SESSIONS

Courses are offered during the summer by all degree-granting divisions of the University: Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Medicine and Health Sciences, the National Law Center, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the Elliott School of International Affairs. During the summer the University also offers special programs that are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the spring semester may register for the following Summer Sessions without special application. All others must apply for admission or readmission. No application fee is charged for nondegree students. Those who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through the Office of University Students and are subject to its entrance requirements and regulations stated above.

For a complete statement concerning summer term work, see the Summer Sessions Announcement.

## RESEARCH CENTERS AND INSTITUTES

The University recognizes that research contributes significantly to the academic stature, achievement, and capability of the faculty in fulfilling their responsibilities as teachers and public servants. To that end, the University seeks to ensure the close integration of research and teaching, including the employment of students in sponsored projects and the use of research facilities for instructional purposes. The following units are presently chartered for these purposes; the head of each unit is indicated in parentheses.

- Biostatistics Center (M. Halperin)
- Center for Digestive, Liver, and Biliary Diseases (H. Fromm)
- Center for High Technology (H. Liebowitz)
- Center for International Science and Technology Policy (R. Rycroft)
- Center for Social Policy Studies (S. Levitan)
- Center for the Study of Education and National Development (J. Boswell)
- Center for Washington Area Studies (D. Gale)
- Division of Research, Psychiatry, and Behavioral Sciences (D. Reiss)
- ERIC Clearinghouse on Higher Education (J. Fife)
- First Federal Congress Project (C. Bickford)
- Graduate Institute for Policy Studies (A. Adams)
- Institute for Advanced Study of Immunology and Aging (A. Goldstein)
- Institute for Artificial Intelligence (B. Silverman)
- Institute for Disease Prevention (O. Alabaster)



- Institute for Information Science and Technology (W. Kahn)  
Institute for Management Science and Engineering (W. Marlow)  
Institute for Medical Imaging and Image Analysis (R. Allman, M. Loew)  
Institute for Reliability and Risk Analysis (N. Singpurwalla)  
Institute for Sino-Soviet Studies (W.R. Johnson)  
Institute for the Study of Fatigue, Fracture, and Structural Reliability  
(H. Liebowitz)  
Institute for Technology and Strategic Research (H. Liebowitz)  
Institute for Urban Development Research (D. McGrath)  
Intergovernmental Health Policy Project (R. Merritt)  
International Water Resources Institute (K. Mahmood)  
Joint Institute for the Advancement of Flight Sciences (H. Liebowitz)  
Labor Management Institute (B. Burdetsky, M. Lovel)  
Lipid Research Clinic (J. LaRosa)  
Medical Decision Center (R. Riegelman)  
National Center for Innovation in Corrections (J. Schloegel)  
National Health Policy Forum (J. Jones)  
Public Policy Program (A. Adams)  
Rehabilitation Research and Training Center (D. Reiss)  
Space Policy Institute (J. Logsdon)  
Wilson Genetic Counseling Center (J. Larsen)



## COURSES OF INSTRUCTION

The following section provides listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as listed here are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

## HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors, and carry the same amount of credit.

## EXPLANATION OF COURSE NUMBERS

**First-Group Courses**—Courses numbered 1–100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

**Second-Group Courses**—Courses numbered 101–200 are planned for students in the junior and senior years. Except for accountancy courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accountancy courses numbered 101–200 may not be taken for graduate credit.

**Third-Group Courses**—Courses numbered 201–300 in the Graduate School of Arts and Sciences, the School of Government and Business Administration, and the School of Education and Human Development are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

**Fourth-Group Courses**—Courses numbered 301–400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301–400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 301–400, are limited to graduate students with master's degrees from accredited institutions.

**Fifth-Group Courses**—Courses numbered 701 and 721 represent an ongoing program of curriculum innovation at GWU. The 701 number is used to designate experimental courses taught by individual faculty members. The 721 number designates innovative interdepartmental courses. The 751 number is used to list courses sponsored jointly by two or more schools. Courses numbered in the 770s are taught by scholars who hold appointments as University Professors. The 700 numbers do not indicate the level of difficulty. Courses in this series range from freshman-level offerings to classes designed for seniors and graduate students. Unless the course description in the *Schedule of Classes* indicates that there are



prerequisites or that an interview with the instructor is required prior to registration, 700 courses are open to all interested students, subject to their advisor's approval and the rules of the respective colleges.

## KEY TO ABBREVIATIONS

The following abbreviations are used for course designations:

Accy	Accountancy	Hist	History
AdSc	Administrative Sciences	HmKn	Human Kinetics
AHA	Allied Health Administration	HRD	Human Resource Development
AmCv	American Civilization	HmSr	Human Services
Anat	Anatomy	Hmn	Humanities
Anes	Anesthesiology	Idis	Interdisciplinary Courses
Anth	Anthropology	IAff	International Affairs
ApSc	Applied Science	Ital	Italian
Art	Art	Japn	Japanese
ArTh	Art Therapy	Jour	Journalism
AM	Association Management	Kor	Korean
Bioc	Biochemistry	Law	Law
BiSc	Biological Sciences	Libr	Library
BAd	Business Administration	Mgt	Management Science
Chem	Chemistry	Math	Mathematics
CH&D	Child Health and Development	ME	Mechanical Engineering
Chin	Chinese	Med	Medicine
CE	Civil Engineering	Micr	Microbiology
Clas	Classics	MStd	Museum Studies
CIEn	Clinical Engineering	Mus	Music
Comm	Communication	NSc	Naval Science
CpMd	Computer Medicine	NSur	Neurological Surgery
CSci	Computer Science	Neur	Neurology
Cnsl	Counseling	Ob&G	Obstetrics and Gynecology
Derm	Dermatology	OR	Operations Research
Econ	Economics	Opht	Ophthalmology
Educ	Educational Leadership	Orth	Orthopaedic Surgery
EE	Electrical Engineering	Path	Pathology
EMed	Emergency Medicine	Phar	Pharmacology
EAD	Engineering Administration	Phil	Philosophy
EngS	Engineering Science	Phys	Physics
Engl	English	Phyl	Physiology
EFL	English as a Foreign Language	PCm	Political Communication
E&RP	Environmental and Resource Policy	PSc	Political Science
EnHe	Environmental Health	Port	Portuguese
Envr	Environmental Studies	Pchi	Psychiatry and Behavioral Sciences
ExSA	Exercise and Sport Activities	Psyc	Psychology
ForS	Forensic Sciences	PAd	Public Administration
Fren	French	PubH	Public Health
Gnet	Genetics	PPol	Public Policy
Geog	Geography and Regional Science	Rad	Radiology
Geol	Geology	Rel	Religion
Ger	Germanic Languages and Literatures	Rom	Romance Literatures
Gern	Gerontology	Rmn	Romanian
HCS	Health Care Sciences	SLP	Service-Learning Program
HSA	Health Services Administration	Slav	Slavic Languages and Literatures
		Soc	Sociology
		Span	Spanish
		SpEd	Special Education



<b>SpHr</b>	Speech and Hearing	<b>TrDa</b>	Theatre and Dance
<b>Stat</b>	Statistics/Computer and Information Systems	<b>T&amp;T</b>	Travel and Tourism
<b>Surg</b>	Surgery	<b>Univ</b>	University
<b>TrEd</b>	Teacher Education	<b>U&amp;RP</b>	Urban and Regional Planning
<b>TCom</b>	Telecommunication	<b>Urol</b>	Urology
		<b>WStu</b>	Women's Studies

### SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving 3 semester hours of credit each semester is marked (3-3), and a semester course giving 3 semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

### TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term *academic year* is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this Bulletin. Students should consult the Summer Sessions Announcement for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

### ACCOUNTANCY

Professors A.J. Mastro, F.C. Kurtz, C.M. Paik, M.G. Gallagher, J. Hilmy (Chair), F.W. Segal  
 Professorial Lecturers S.M. Farag, P. Ben Ezra  
 Associate Professor D.R. Sheldon  
 Associate Professorial Lecturer L.G. Jordan  
 Assistant Professors K.E. Smith, L.C. Moersen, L.G. Singleton, B.C. Horn, S.N. Cory, P. Witmer (Visiting)  
 Assistant Professorial Lecturer J.L. Eggleston

See the School of Government and Business Administration for programs of study in accountancy leading to the degrees of Bachelor of Accountancy, Master of Accountancy, Master of Taxation, and Doctor of Philosophy.

Accountancy courses numbered below 201 may not be taken for graduate credit. Accountancy courses numbered 201 and above may not be taken for undergraduate credit.

#### First Group

##### 51 Introductory Financial Accounting (3)

Basic knowledge of financial accounting concepts and standards as an essential part of the decision-making process for the management of private investments and for business and government organizations. Students who have received credit for a similar financial accounting course cannot receive credit for Accy 51. (Fall and spring)

##### 52 Introductory Managerial Accounting (3)

Basic knowledge of managerial accounting concepts, procedures, analyses, and internal reports as an essential part of the decision-making process for public and private-sector organizations. Prerequisite: Accy 51. Students who have received credit for a similar managerial accounting course cannot receive credit for Accy 52. (Fall and spring)



## Second Group

- 101 **Cost and Budgetary Control** (3) Singleton  
Cost behavior and volume-profit relationships, responsibility accounting, standard costs, cost structures for control and decision making, relevant costs, cost concepts, and variance analyses. Prerequisite: Accy 51-52. (Fall and spring)
- 111 **Financial Statement Analysis** (3) Hilmy, Witmer  
Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Accy 51-52. (Fall and spring)
- 121 **Intermediate Accounting** (3) Mastro  
In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Accy 51-52. (Fall)
- 132 **Accounting Theory** (3) Hilmy  
Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Accy 121. (Spring)
- 151 **Business Law for Accountants I** (3) Moersen  
An introduction to the legal process and business law concepts for the professional accountant. Contracts, sales, commercial papers, business torts, and property, with concern for professional accounting certification; the interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Accy 51-52. (Fall)
- 152 **Business Law for Accountants II** (3) Moersen  
A broadening of business law concepts—partnerships, corporations, agency, secured transactions, trusts, wills, insurance, and securities. Legislation and litigation of the professional accountant's liability as an auditor and tax advisor. The interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Accy 151. (Spring)
- 161 **Federal Income Taxation: Individuals** (3) Smith  
A study of federal income tax concepts with primary emphasis on individuals. Prerequisite: Accy 51-52. (Fall)
- 162 **Federal Income Taxation: Corporations, Partnerships, Estates, and Trusts** (3) Smith  
Federal income tax concepts applicable to corporations, partnerships, estates, and trusts; tax research and planning. Prerequisite: Accy 161. (Spring)
- 171 **Auditing** (3) Horn  
Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, audit evidence, professional and legal responsibility, and audit of EDP systems. Prerequisite: Accy 121. (Fall)
- 181 **Accounting Systems** (3) Segel  
Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Accy 101, 121. (Fall)
- 190 **Special Topics in Accounting** (3) Staff  
Experimental offering; new course topics and teaching methods. Prerequisite: Department approval.
- 191 **Advanced Accounting** (3) Mastro  
Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Accy 121. (Spring)
- 199 **Independent Study** (3) Staff  
Assigned topics. Admission by permission of the Department Chairman. (Fall and spring)



## Third Group

## 201 Financial Accounting (3)

Kurtz, Singleton

The role of accounting in the decision-making process of external parties; the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Accy 51-52, or two similar undergraduate courses.) (Fall and spring)

## 202 Management Accounting (3)

The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Accy 201. (Fall and spring)

## 211 Business Law for Accountants (3)

Moers

A study of the legal process and the principles and precepts of business law within the context of the political and legal environment of business. Corporations, partnerships, securities, the debtor-creditor relationship, trusts, wills, and the legal liability and ethical standards of the accountant. (Fall and spring)

## 221 Cost and Budget Analysis (3)

An advanced cost analysis course, with emphasis on comparative costs, quantitative techniques for cost data, managerial reporting systems, and manufacturing efficiency studies. Prerequisite: Accy 201 and 202. (Spring)

## 225 Financial Reporting Standards (3)

Segel, Sheldon

A critical understanding of the Financial Accounting Standards Board Pronouncements (Standards) and the Security and Exchange Commission Accounting Series Releases. Prerequisite: Accy 201 and 202. (Fall and spring)

## 242 Business Income Taxation (3)

Gallagher

Federal tax concepts applicable to individuals, partnerships, fiduciaries, and corporations; emphasis on recognition of tax consequences attached to common business transactions and on tax planning. Not open to Master of Accountancy or Master of Taxation candidates. (Fall and spring)

## 251 Accounting for Multinational Corporations (3)

Hilmer

A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Accy 201. (Fall and spring)

## 255 Business Combinations and Not-for-Profit Organizations (3)

Hilmer

Corporate concepts, business combination policies, including FASB, SEC, and AICPA business combination pronouncements. Structure analysis of combined and consolidated financial statements; accounting for not-for-profit and governmental organizations. Prerequisite or (with approval of instructor) concurrent registration: Accy 225. (Fall)

## 260 Tax Research and Planning (3)

Smith

A study of the legislative, administrative, and judicial sources of federal tax law. Emphasis on the use of tax research tools in locating, interpreting, and communicating tax law and on the complementary relationship between legal research and quantitative decision making. Prerequisite or concurrent registration: Accy 261. (Fall)

## 261 Federal Income Taxation (3)

Gallagher

A study of federal income taxation, covering gross income, deductions and credits, sales and other disposition of property, capital gains and losses, and timing. (Fall and spring)

## 262 Federal Income Taxation of Partnerships (3)

Smith

Federal income taxation of partnerships; formation, operation, distribution, and transfer of partnership interests. Prerequisite: Accy 261. (Spring)

## 263 Federal Income Taxation of Corporations (3)

Gallagher

A study of federal income taxation of "C" and "S" corporations, covering formation, capital structure, nonliquidating distributions, complete liquidations, corporate accumulations, and the alternative minimum tax. Prerequisite or concurrent registration: Accy 261. (Fall and spring)



- 264 **Federal Taxation of Estates and Gifts** (3) Smith  
A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Accy 261. (Spring)
- 265 **Tax Practice and Procedure** (3) Smith  
A study of federal tax practice and procedure, including organization of the IRS, ethical responsibilities, statute of limitations, examination of returns, claims for refund, penalties, and tax rulings. Prerequisite or concurrent registration: Accy 261. (Fall)
- 266 **Corporate Reorganizations and Affiliations** (3) Smith, Gallagher  
Advanced study of corporate taxation: corporate reorganizations, multiple corporations, consolidated returns, and carryover of tax attributes. Prerequisite: Accy 263. (Spring)
- 267 **Estate Planning** (3) Gallagher, Smith  
Selected studies in estate and financial planning, with emphasis on estate, gift, and income tax considerations. Prerequisite: Accy 264. (Fall)
- 268 **Deferred Compensation** (3) Gallagher, Smith  
A study of tax aspects of deferred compensation arrangements, including qualified pension, profit-sharing, and stock bonus plans; retirement plans for self-employed individuals; individual retirement accounts; and stock options. Prerequisite or concurrent registration: Accy 261. (Spring)
- 275 **Contemporary Auditing Theory** (3) Kurtz, Horn  
Study of advanced independent (external) and internal auditing concepts: operational auditing, application of statistical sampling to auditing, audit of electronic data processing systems, computer applications, ethics. Prerequisite: Accy 225. (Spring)
- 282 **Accounting Information Systems and EDP** (3) Segel  
Development and application of accounting system theory, including analysis, design, and implementation. Integration of electronic data processing, accounting systems, and management information systems. Prerequisite: Accy 201. (Fall)
- 290 **Special Topics in Accounting** (3) Staff  
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall and spring)
- 297 **Professional Accountancy and Business/Government Policy** (3) Sheldon, Mastro  
A study of the development process of professional accounting standards through examination of the socioeconomic, political, legal, and management process. Management policy concerns for alternatives in the selection of accounting standards. Prerequisite: Master of Accountancy or Master of Taxation status. This course must be taken during the last semester of the program and will not be waived. (Fall and spring)
- 298 **Directed Readings and Research in Accounting** (3) Staff

#### Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. The courses are open to selected master's students upon petition approved by the Associate Dean.

- 311-12 **Seminar: Public-Private Sector Institutions and Relationships** (3-3) Staff  
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.
- 391 **Doctoral Seminar in Accounting** (arr.) Sheldon, Paik  
Reasoning and research in technical areas of accounting; theoretical issues and their application to practice; conceptual themes in professional literature; comparative accounting research analyses. (Fall and spring)



**398 Advanced Reading and Research (arr.)**

Limited to doctoral candidates preparing for the general examination. May be repeated for credit. Staff

**399 Dissertation Research (arr.)**

Limited to doctoral candidates. May be repeated for credit. Staff

**ADMINISTRATIVE SCIENCES—GRADUATE PROGRAM**

Professors J. Zeidner (*Director*), E. Cherian (*Visiting*)

Professorial Lecturers A. Adams, J. Allen, J. Baker, C. Chambers, M. Donnell, H. Eskew, J. Harper, O. Jacobs, E. Johnson, J. Robins, R. Sadacca, M. Sashkin

Associate Professors J. Harrald, B.S. Hodges III

Associate Professorial Lecturers R. Belous, J. Brilliant, J. Georgatos, B. Kutnick, J. Larocco, J. McHenry, C. Perdue, T. Rosen, L. Tanner

Assistant Professor K. Hamel

Instructor E. Bailey

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of administrative sciences. The program has been designed for public and private sector professionals who wish to increase their managerial competence and to improve their career potential. The program provides knowledge and skills in the social, behavioral, quantitative, and information sciences.

*Master of Arts in the field of administrative sciences*—Prerequisite: a bachelor's degree with a B average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. There is no thesis requirement. AdSc 221, Econ 217, OR 233, Psyc 244, and Stat 104 constitute the core curriculum. A student may specialize in management information systems, human resources management, or organizational management. The management information systems track requires AdSc 201, 202, 203, 205, 206, 219, and 225. The human resources management track requires AdSc 211, 212, 213, 214, 220, 222, and 223. The requirements for the organizational management track are Psyc 245, 246, and 260; AdSc 215, 216, 217, and 240. All students must pass a Master's Comprehensive Examination.

**201 Principles of Management Information Systems (3)**

An overview of the management information systems specialty track. Integration of management, information, and systems concepts into a unified framework. Relationship of structure and organizational objectives to information, systems, and management. General systems theory: open, closed, deterministic, and probabilistic systems; interface, independence; decoupling and integration; feedback loops. Information theory: data vs. information, the value of information, redundancy, summarizing and filtering. Management information systems development, design, implementation, and evaluation strategies. Prerequisite: AdSc 221.

**202 Database Management and Operating Systems (3)**

Fundamental concepts of operating systems and database management systems that serve as the foundation for information system design and development. Technological framework for design and implementation of a computerized management information system. Hardware and software configuration, design strategies and alternatives, and analytical techniques. Operating systems, dynamic storage management, virtual memory process management, control languages, and systems routines. Applications of data-and-file structuring approaches. Database management systems use and analysis. Prerequisite: AdSc 201 and the administrative sciences core curriculum except OR 233; degree candidacy or permission of instructor.

**203 Data Communications and Networking (3)**

Advanced concepts in analysis and development of computer-based information systems. Network, structures, design, and management. Distributed data processing techniques and local and network design; development of telecomm-



munication procedures, including forms of communication, transmission media, communication software. Applications of file and report-writing facilities in microcomputer and mainframe environments. Comparison of alternative implementation strategies used in the design of management decision-making systems. Prerequisite: AdSc 201 and the administrative sciences core curriculum except OR 233; degree candidacy or permission of instructor.

**205 Decision Support Systems (3)**

Analysis and comparison of existing frameworks, techniques, and tools for assisting management in the decision-making process. Overview of alternative approaches (e.g., centralized vs. decentralized control) to the design, development, and implementation of decision support systems. Hardware and software limitations of alternative approaches, focusing on anticipated future technological improvements. Introduction to computer-based decision-making aids and simulations. Contemporary issues and problems in effective implementation of decision support systems. Prerequisite: AdSc 202, 203; OR 233.

**206 Artificial Intelligence and Expert Systems (3)**

An introduction to the principles of artificial intelligence, including its practical applications in robotics, natural language programs, and advanced computer input-output devices. Review and analysis of various expert systems, including tools and generators, classification vs. diagnostic type systems, and building modules. Examination of the design of expert systems, including development of the knowledge base and role of the knowledge engineer. Prerequisite: AdSc 202 and 203.

**207 Information Systems Design (3)**

Introduction to the design and analysis of information systems. The systems development life cycle, analysis of requirements, design of logical systems, analysis and design of user interfaces, system documentation and specifications. Planning for system implementation, evaluation, and maintenance. Prerequisite: AdSc 205.

**211 Psychology of Personnel Management (3)**

An overview of the human resources management specialty track. An examination, from a psychological systems perspective, of a unified human resources management program, including integration of human resources planning, job analysis, employee selection, placement, training, performance evaluation, compensation management, and management information systems. Analysis of the psychological theories underlying major personnel systems.

**212 Current Issues in Personnel Testing and Selection (3)**

An overview of psychometric, legal, and organizational issues in personnel employment testing and selection, with emphasis on reliability and validity of selection instruments and the utility of selection systems. Analysis of the legal environment, including test fairness in selection, adverse impact, and statistical models of test fairness and specific selection techniques, such as the employment interview, psychological tests, work samples, and assessment centers. Prerequisite: Stat 104 and AdSc 211.

**213 Managerial Leadership, Motivation, and Work (3)**

Application of the scientific study of leadership to the managerial environment. Analysis of leadership behavior and managerial activities. Synthesis of major theories of leadership, including trait, behavior, situational, and power-influence. Synthesis of motivational theories, including acognitive and cognitive perspectives. Application of theories at various levels of formal organizations beyond the interpersonal perspective. Prerequisite: AdSc 211.

**214 Personnel Training and Performance Appraisal Systems (3)**

Analysis of training and appraisal techniques in contemporary organizations. Training topics include development of management training programs and training evaluation techniques. Appraisal topics include development of performance appraisal techniques, evaluation of appraisal systems, maintenance of relationship of rewards to performance, and the appraisal interview. Analysis of



- training and rating systems that satisfy legal requirements and stimulate employee productivity. Prerequisite: AdSc 212.
- 215 **Current Issues in Organizational Design (3)**  
Analytical framework for the design of complex organizations, including the hierarchical bureaucratic, functional, and matrix structures. Examination of organizational technologies, control and boundaries, including design approaches emanating from Europe, Japan, and the United States, drawing on system theory and moving toward broader organizational design issues.
- 216 **Theories and Management of Planned Change (3)**  
A systems view of organizational change and development, including intervention strategies, data collection diagnosis, and the integration and management of system-wide organizational change.
- 217 **Productivity and Human Performance (3)**  
Definitions and measurement of individual, team, and organizational productivity, effectiveness, and efficiency. Models for the analysis of organizational and individual productivity and productivity growth in industrialized nations. Techniques for increasing productivity.
- 218 **Design of User-Computer Interface (3)**  
Study of user-computer interaction. Presentation of the theoretical bases of user-computer interaction, along with integration of research findings into guidelines for systems developers and users. Information processing topics include input, storage and retrieval, display, dialogue. Interaction topics include environmental factors, user variables, help functions, system design, and multiple users. Prerequisite: AdSc 201; degree candidacy or permission of instructor.
- 219 **Information Security and Policy (3)**  
Computer fraud and effective countermeasures for computer system security. The social and legal environment of information systems, including data privacy and ethics in database management. Information access policy, data security, contracts. Antitrust and other business implications of policies, transborder data flow, technology transfer, electronic funds transfer systems, mail, criminal justice information systems, cross-cultural differences, computer infringement of copyright, and protection of property rights in software. Prerequisite: AdSc 202, 203.
- 220 **Organizational Decision Making (3)**  
Examination of processes in organizational decision making; the state of theory, research and applications for the practicing manager. Topics include managerial style and decision making, problem discovery and diagnosis, search for the design of solution, evaluation and choice, group decision making, decision aids and support systems, performance and decision effectiveness, and risk analysis and decision making. Prerequisite: AdSc 211.
- 221 **Introduction to Computers, Programming, and Information Systems (3)**  
Introductory concepts in computer hardware, computer architecture, and software and management information systems. Information systems principles including data processing applications, data communications, database management, and operating systems. Principles of good programming style, expression, and documentation. Introduction to program structures, structured modularization, structured programming concepts; stepwise refinement and top-down programming. Computer-based utilization of MIS for planning, control, and decision-making functions.
- 222 **Theory and Practice of Compensation Management (3)**  
Analysis of contemporary compensation systems from both theoretical and practical perspectives, including the latest decisions of courts and regulatory agencies. Examination of motivational theories of pay, determinants and effects of salary structures on performance, incentive plans, and managerial compensation systems. Prerequisite: AdSc 214.
- 223 **Collective Bargaining (3)**  
Analysis of federal and state employee relations laws and regulations. Topics include the bargaining environment, wage and benefit issues in arbitration.



arbitration of grievances, and employee relations in non-union organizations. Behavioral theories of labor negotiations. Prerequisite: AdSc 222.

**225 Management Information Systems Development (3)**

The capstone course of the MIS track. Individual and team working experience in the actual design, development, implementation, and evaluation of a computerized management information system. Synthesis of organizational and technological aspects of development of information systems, with emphasis on needs assessment, organizational structures, and comprehensive evaluation techniques. Utilization of micro and mainframe environments in the design of the project. Prerequisite: AdSc 205, 206, 219.

**240 Corporate Policy and Social Responsibility (3)**

Examination of the process of policy analysis, development, and implementation. Analysis of policy mechanisms, including technology assessment, research and development, regulatory and control mechanisms. Illustrative examples of policy issues and problems drawn from government and industry, covering a broad range of substantive areas.

**295 Directed Research in Administrative Sciences (arr.)**

Supervised research in selected fields within Administrative Sciences. Admission by prior permission of faculty advisor and sponsoring instructor.

**298 Directed Readings in Administrative Sciences (arr.)**

Supervised readings in selected fields within Administrative Sciences. Admission by prior permission of faculty advisor and instructor.

## AMERICAN STUDIES PROGRAM

University Professor M.F. Cunliffe

Professors R.H. Walker, Jr., C.C. Mondale, B.M. Mergen, H.F. Gillette, Jr. (Director), J.M. Vlach

Adjunct Professor F. Gutheim

Professorial Lecturers L. Miller, W.E. Washburn

Associate Professors J.O. Horton, R.W. Longstreth, P.M. Palmer

Adjunct Associate Professors P.J. Cressey, J. Warren-Findley

Associate Professorial Lecturer B.G. Carson

### Undergraduate Faculty Advisory Committee

H.F. Gillette, Jr. (Chair), C.J. Deering, P.P. Hill, R.L. Humphrey, L.F. Robinson, O. Seavey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

### Graduate Committee

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*Bachelor of Arts with a major in American civilization (field-of-study)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—AmCv 71-72. Other introductory courses as needed for upper-division courses in a discipline as described below.
3. An American studies core, which may be obtained by taking AmCv 167, AmCv/Hist 171-72, and at least 9 hours chosen from AmCv/Hist 771, AmCv/Engl/Hist 772, AmCv/Engl 160, 161, 162; also expected is a specialized focus, normally developed through at least 12 hours of second-group courses in a discipline or theme chosen so as to provide a structured approach to the range of American civilization (accepted approaches include sociology, history, literature, history of art and architecture, political science, philosophy and religion, gender studies, urban studies). The proseminar, AmCv 179-80, should be taken in the last full year of residence in preparation for the comprehensive examination that covers the core courses and special discipline or theme.

Special Honors will be awarded to students who fulfill the requirements for the major



with a grade point average of 3.5 or better in the required courses and 3.0 or better overall and who receive honors on the comprehensive examination.

At least two years of a foreign language and knowledge of statistics or computer programming in the humanities and social sciences is strongly recommended. Students must consult at least once a semester with their American studies advisor.

*Minor in American civilization*—Requirements are 18 hours of 100-level courses, including AmCv 167 and AmCv/Hist 171-72 plus 9 hours chosen from the following two options: (1) AmCv/Hist 771, AmCv/Engl/Hist 772, AmCv/Engl 160, 161, 162; (2) related courses in American civilization, such as topics in urbanism, gender, black culture, folklife, philosophy and religion, literature, art and/or architecture.

*Master of Arts in the field of American civilization*—Prerequisite: the degree of Bachelor of Arts in American civilization or a related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) AmCv 271-72; (2) 18 semester hours chosen in a carefully related pattern of study of American civilization; (3) a comprehensive examination covering general competence in American civilization and the candidate's area of concentration; (4) a thesis (6 semester hours) written on a topic approved by the student's advisor or, with permission of the advisor and the director of the program, 12 semester hours of additional course work, 6 of which must be research oriented. Special options in the master's degree program include the following.

1. *A concentration in museums and material culture*—Course emphasis on the use of artifacts in historical research, offered in association with the Smithsonian Institution. Required in addition to the general requirements outlined above: AmCv 250. Recommended: courses in decorative arts, architectural history, historical archaeology, history of technology, and history of art.

2. *A concentration in historic preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: a course in American architectural history. For this concentration, the general requirements outlined above are amended as follows. Required: 36 semester hours, consisting of 12 hours of American civilization courses including AmCv 271-72; 18 hours of historic preservation courses including AmCv 277-78; a thesis (6 hours). A comprehensive examination, as outlined above, is required.

3. *A concentration in folklife*—Course emphasis on the expressive culture of American folk societies and theories and methods for its evaluation and interpretation. Required in addition to the general requirements outlined above: AmCv 254, 257. Recommended: courses in topics related to folklife, such as regionalism, oral history, material culture, vernacular architecture, and social and cultural history.

*Doctor of Philosophy in the field of American civilization*—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements stated under the Graduate School of Arts and Sciences and successful completion of a reading knowledge examination in an approved foreign language. Candidates must pass a General Examination in four areas within three calendar years of matriculation. American cultural history is the only required field. Three other fields are elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history; folklife, literature, art, philosophy, or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in association with staff at the Library of Congress—supervised historical study in bibliographic resources, including American history and politics, cartography, cross-cultural studies, government documents, graphic arts, music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution—supervised studies including aerospace history, decorative arts, ethnohistory, history of science, history of technology, industrial archaeology, material aspects of American civilization, and various fields in the history of art. Additional areas of



study may be arranged within the University and in both the Library of Congress and the Smithsonian. Special announcements concerning these programs are issued periodically and are available in the office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

### First Group

#### 50 Washington, D.C.:

##### **History, Culture, and Politics (3)**

Gillette and Interdisciplinary Teams

Introduction to interdisciplinary methods of studying the contemporary city. Major problems of metropolitan life, past and present, analyzed by faculty and community leaders. Emphasis on experiential team projects. Same as Hist/PSc/U&RP 50. (Fall)

#### 71-72 **Introduction to American Civilization (3-3)**

Gillette, Vlach

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

### Second Group

#### 115 **Field Program in Mesoamerican**

Humphrey, Mergen

##### **Archaeology and History (3 or 6)**

Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

#### 144 **Explorations in Historical Geography (3)**

Mondale

Examination of selected themes in the cultural geography of the United States over the course of its history, in relation to an overview of the historical geography of the country. Same as Geog 144. (Spring)

#### 160 **Early American Literature and Culture (3)**

Seavey

Same as Engl 160.

#### 161 **American Romanticism (3)**

Sten

Same as Engl 161.

#### 162 **American Realism (3)**

Romines

Same as Engl 162.

#### 165-66 **Introduction to Folklore (3-3)**

Vlach

Forms of folk expression, including verbal, art, music, dance, and material culture. AmCv 165: The materials and methods of folklore research. AmCv 166: The folk cultures of the United States—Native Americans, Euro-Americans, Afro-Americans. Same as Anth 165-66. (Academic year)

#### 167 **Themes in U.S. Cultural History (3)**

Mondale

An examination of the special ideas, values, and modes of expression that have made American life distinctive, as revealed through a variety of sources, including fiction, popular media, photography and the arts, and material culture. Same as Hist 167. (Fall)

#### 171-72 **U.S. Social History (3-3)**

Horton

Same as Hist 171-72.

#### 173 **Afro-American History (3)**

Horton

Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Spring)

#### 174 **Afro-American Literature (3)**

Staff

Study of texts representing the experience of black Americans and the ideas and social forces that have shaped their lives and writings. Same as Engl 174.

#### 175-76 **American Architecture (3-3)**

Longstreth

Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form and type characteristics, technological developments, and urbanistic patterns are introduced as a means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600-1860; U&RP/AmCv 176: 1860-present. Same as Art 176 and 191. (Academic year)



- 177 **Introduction to Historic Preservation** (3)  
Washington, D.C., will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. Same as U&RP 177. (Spring) Gale
- 179-80 **Proseminar in American Civilization** (3-3)  
Coordinating course for seniors majoring in American Civilization. (Academic year) Mondale
- 184 **Contemporary American Civilization** (3)  
Examination of the patterns of contemporary American life through study of literature, the arts, and political, social, cultural, and economic trends. Staff
- 185 **History of Women in America** (3)  
Same as Hist 185. DePauw
- 186 **U.S. Urban History** (3)  
History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. Same as Hist 186. (Fall) Gillette
- 192 **The American Cinema** (3)  
History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. Same as Art 192. (Spring and summer) Mergen
- 193 **Field and Laboratory Research in Archaeology** (3)  
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. (Summer) Cressey
- 194 **Introduction to Historical Archaeology** (3)  
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring) Cressey
- 195 **Independent Study** (3)  
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring) Staff
- 197 **Oral History and Interview Techniques** (3)  
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. Same as Anth/Hist 197. (Summer) Mergen, Gillette
- 198 **Special Topics in American Studies** (3)  
May be repeated for credit provided the topic differs. Admission by permission of instructor. Staff

### Third Group

- 225 **History of Washington, D.C.** (3)  
The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Same as Hist 225. (Spring) Gillette
- 254 **Folklore Theory** (3)  
An intellectual history of American folklore research; analysis of particular theories and methods. Same as Anth 254. (Spring) Vlach



- 255-56 **Research Orientation Seminar:**  
**Americana Collections** (3-3) Warren-Findley  
 Examination of major themes in American civilization as they relate to the collections in major Washington-area libraries. Full-year course with direct exposure to Library staff and materials. May be taken either as a conventional seminar culminating in a research paper or as preparation for a doctoral reading field, "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Alternate academic years)
- 257 **Seminar: American Folklife** (3) Vlach  
 Research and discussion on the traditional cultures of various geographical regions of the United States. Analysis of folk art, craft, and architecture; regional and ethnic identities. Same as Anth 257. (Fall)
- 259 **Topics in American Folklife** (3) Staff  
 A seminar devoted to a variety of subjects related to folklore and folklife, such as public-sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty. May be repeated for credit. Same as Anth 259.
- 260 **Women in the American Work Force** (3) Palmer  
 Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and gender-based division of labor. Views of women's work in the home and outside it; interrelationships of women in and out of the work force; class, race, and ethnic differences. (Spring)
- 271-72 **Seminar: Scope and Methods in American Studies** (3-3) Mondale  
 Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American civilization. (Academic year)
- 275 **The Politics of Historic Preservation** (3) Staff  
 Same as U&RP 275.
- 276 **Economics of Preservation** (3) Staff  
 Same as U&RP 276.
- 277-78 **Historic Preservation: Principles and Methods** (3-3) Longstreth  
 Joint offering of the American Studies Program and the Urban and Regional Planning Department. Same as Hist 277-78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics covered include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)
- 282 **Seminar in American Architecture** (3) Longstreth  
 Advanced research problems addressing artistic, cultural, social, technical, and urbanistic aspects of American architecture in the 19th and 20th centuries. Topics vary. Prerequisite: AmCv 175 or 176 or equivalent, or permission of instructor. (Spring, alternate years)
- 286 **Interpretation in the Historic House Museum** (3) Stapp  
 Same as Educ 286.
- 289-90 **Seminar: Topics in American Civilization** (3-3) Staff  
 Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)
- 294 **Field and Laboratory Research in Archaeology** (3) Cressey  
 Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. Same fieldwork as AmCv 193 but with additional readings and research required. (Summer)



**295 Independent Study** (arr.)

Limited to master's candidates. Written permission of instructor required.  
(Fall and spring) Staff

**299-300 Thesis Research** (3-3)  
(Fall and spring) Staff
**Fourth Group****351 Vernacular Architecture** (3) Vlach

Examination of selected regional and ethnic traditions in American building.  
Survey and field techniques, comparative study of related types of objects, and  
use of documentary sources. (Spring)

**355-56 Practicum: Advanced Library Research** (3-3)

Practical problems in control of library materials with emphasis on collections in  
major area libraries. Prerequisite: AmCv 255-56. (Academic year)

**379-80 Readings in American Cultural History** (3-3) Mergen, Walker

For students preparing for the Doctor of Philosophy general examination in the  
field of American civilization. (Academic year)

**398 Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination.  
May be repeated for credit. (Fall and spring)

**399 Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit.  
and spring) (Fall)

**COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION**

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the National Museum of American History and at the National Portrait Gallery by members of their staffs.

**Third Group****250 Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen

Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

**251 Museum Research and Education** (3) Washburn and Staff

Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

**252-53 American Decorative Arts** (3-3) Carson

Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

**284 Seminar: Studies in American Art and History** (3) Miller

Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit.

**285 Technology, Labor, and American Society** (3) Mergen

Selected readings on the interrelations among technology, labor, and society in the United States.



## Fourth Group

- 352 **Research in Selected Aspects of American Civilization** (3)  
Supervised study and/or fieldwork in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)
- 394 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)
- 395 **Dissertation Research** (arr.)  
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. May be repeated for credit. (Fall and spring)

## ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan (Acting Chair), T.N. Johnson, E.N. Albert, M.J. Koering, K.E. Johnson  
Associate Professors F.J. Slaby, R.J. Walsh, K.D. Peusner, J.M. Rosenstein, R.C. Bohn

Doctor of Philosophy in the field of anatomy—Required: The general requirements stated under the Graduate School of Arts and Sciences. Candidates must demonstrate proficiency in biostatistics and computer science. There will be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

- 202 **Gross Anatomy** (6) Slaby and Staff  
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, \$30. (Fall)
- 203 **Human Developmental Anatomy** (1) K. Johnson  
Origin and development of human body; emphasis on study of human development in interpreting anatomical anomalies. (Fall)
- 204 **Neuroanatomy** (2) Peusner  
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, \$13.
- 205 **Human Microscopic Anatomy** (3) Koering and Staff  
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, \$20. (Fall)
- 208 **Comparative Vertebrate Neurology** (1) T. Johnson  
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, \$10. (Spring)
- 209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan  
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, \$20. (Spring)
- 212 **Neurobiology** (3) Staff  
An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Same as Phyl 212. Laboratory fee, \$25.
- 221-22 **Seminar** (1-1) Walsh  
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)
- 249 **Introduction to Anatomical Research** (1) Staff  
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)
- 252 **Physical Anthropology** (1) Staff  
Variations in humans and factors affecting them; human evolution and racial differences; anatomy and culture of ancient humans. (Spring)



- 253 **Brain-Tissue Interactions** (1) Walsh, Rosenstein  
Interactions of the central nervous system with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Anat/Phyl 212. (Spring)
- 254 **Fetal Anatomy** (2) Allan  
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, \$10. (Spring)
- 256 **Teratology** (1) K. Johnson  
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.
- 260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering  
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)
- 261 **Electron Microscopy** (4) Koering  
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, \$25. (Spring)
- 262 **Gross Anatomy of Upper and Lower Extremities** (2) Staff  
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, \$10. (Spring)
- 264 **Gross Anatomy of Head and Neck** (2) Staff  
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, \$10. (Spring)
- 266 **Gross Anatomy of Thorax and Abdomen** (2) Staff  
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, \$10. (Spring)
- 268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Staff  
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, \$10. (Spring)
- 270 **Dissection of the Human Brain** (1) T. Johnson  
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, \$10. (Spring)
- 272 **Autonomic Nervous System** (1) Allan  
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration. (Spring)
- 275 **Advanced Human Embryology** (1) Allan  
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)
- 276 **Advanced Studies in Anatomy** (1) Staff  
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)
- 277 **Special Topics in Neuroanatomy** (3) Bohn, Peusner, Rosenstein, Walsh  
Selected topics regarding the structural and functional organization of the nervous system. May be repeated for credit. (Spring—alternate years)
- 288 **Surface Anatomy and Radiology** (1) Slaby  
Lectures on areas of clinical importance. (Spring)
- 289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby  
The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.
- 295 **Research** (arr.) Staff  
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)



**399 Dissertation Research (arr.)**

Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit.  
and spring)

(Fall

**ANTHROPOLOGY**

Professors R.K. Lewis (Emeritus), R.M. Krulfeld, R.L. Humphrey, Jr., A.S. Brooks  
 Professorial Lecturer D.H. Ubelaker  
 Associate Professors S.L. Simons (Chair), C.J. Allen  
 Adjunct Associate Professors C.R. Rose, P.J. Cressey  
 Associate Professorial Lecturers S. Hertz, C. Cheney, G. McEwen  
 Assistant Professors D. Caro, K. Bragdon (Visiting)  
 Assistant Professorial Lecturers R.K. Evans, D. Begun, B. Hackett, T. Kavanagh  
 Lecturer A.G. Webster

*Bachelor of Arts with a major in anthropology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Anth 1, 2, and 3.
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) 6–12 semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archaeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in biological anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.
4. Requirements for the major—24–36 semester hours in second-group anthropology courses, including Anth 198 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s and 199 and 200), linguistics (161, 162, 168, and 169), ethnology (courses numbered in the 170s), biological anthropology (courses numbered in the 140s), and archaeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archaeology and biological anthropology. Qualified seniors may enroll in 200-level seminar courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archaeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities are available for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed one-quarter of the student's total second-group credit hours in anthropology) may be granted through registration in Anth 195. Candidates for graduation with Special Honors must register for 3 semester hours of Anth 195, Undergraduate Research, and write a paper of special distinction arising out of a program of directed reading or research.

*Bachelor of Arts with a major in classical archaeology and anthropology (departmental)*—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.
3. Required courses in the major: Anth 3, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 107, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).



**Minor in general anthropology**—21 credit hours are required, including Anth 1, 2, 3, 198, and three additional courses in anthropology, no more than two of which may be taken in the same subdiscipline. For the purposes of this minor, the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 146, 147, 148; archaeology—Anth 182, 183, 184, 185, 186, 190, and 194; anthropological linguistics—Anth 161, 162, 168, and 169; sociocultural anthropology—all other second-group courses, with the exception of Anth 195 and 196, in which the topic is variable.

**Minor in archaeology**—18 credit hours are required, including Anth 3, four courses chosen from Anth 182, 183, 184, 185, 190, and 194; an approved field or research course or a fifth course chosen from the preceding list.

**Minor in biological anthropology**—15–18 credit hours are required, including Anth 1, 146, 147, and 148; an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

**Minor in sociocultural anthropology**—18 credit hours are required, including Anth 2 and 198; one course in ethnography (Anth 170–179); Anth 151 or 152; Anth 156 or 157; one course chosen from Anth 150, 153, 155, 158, 159, or 200.

**Minor in cross-cultural communication**—18 credit hours are required, including Anth 2, 161, 162; Anth 150 or 159; one course in ethnography (Anth 170–179); one course chosen from Anth 153, 155, 158, 163, 165, or 168. Psyc 115 is recommended.

**Master of Arts in the field of anthropology**—Prerequisite: a bachelor's degree; a major in anthropology is preferred but not mandatory. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archaeology, and biological anthropology. Students with less background in anthropology may be admitted but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. **General degree**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first 24 semester hours of graduate course work. For students with fewer than four undergraduate semesters of one major foreign language, a reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. **With a concentration in museum training**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work and must include from 12 to 15 semester hours of work in museum-related courses, 6 semester hours of which may be in an internship. Museum training students may substitute for the foreign language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropological theory, are advised to apply to the master's program in museum studies (see Museum Studies).

3. **With a concentration in development**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 36-credit-hour nonthesis program, including 6–9 hours in development anthropology (Anth 220, 221, 222), 18–21 hours in other anthropology courses, and 6–9 hours in economics and economic development. In some circumstances a thesis may be allowed. The program is designed to improve the student's understanding of complex development problems, such as economic change, population, health, education, migration, and ecology, within an



anthropological framework. A limited number of internships will be available at public and private development agencies in the Washington area.

4. *With a concentration in folklife*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 30-credit-hour thesis program consisting of 24 hours of anthropology, including 6 hours of folklore core courses (Anth/AmCv 254 and 257). In some circumstances a 36-credit-hour nonthesis program may be allowed.

Master of Science and Doctor of Philosophy in the field of geobiology—see Geobiology.

#### First Group

- 1 **Introduction to Biological Anthropology** (3) Brooks and Staff  
Survey of human evolution, genetics and physical variation, and primatology. Frequent laboratory exercises. Laboratory fee, \$15. (Fall and spring)
- 2 **Introduction to Sociocultural Anthropology** (3) Allen, Caro, Krulfeld, Simons  
Survey of the world's cultures, illustrating the principles of cultural behavior. (Fall and spring)
- 3 **Introduction to Archaeology** (3) Humphrey, Brooks  
Introduction to archaeological survey and excavation techniques and laboratory methods of dating and analysis. Brief history of archaeology and survey of world prehistory. Films and laboratory exercises. (Fall and spring)

#### Second Group

- 115 **Field Program in Mesoamerican Archaeology and History** (3 or 6) Humphrey, Mergen  
Joint offering of the American Studies Program and the Department of Anthropology. Field study of archaeological and historical sites in Mexico and Central America. (Summer)
- 146 **Biological Anthropology of Modern Man** (3) Ubelaker  
(Formerly Anth 186)  
An overview of human variation, with special emphasis on the skeleton. Includes history of physical anthropology, individual and population variations, archaeological recovery of human remains, paleodemography, growth, paleopathology, and forensic anthropology. Prerequisite: Anth 1. (Spring)
- 147 **Introduction to Hominid Evolution** (3) Brooks  
(Formerly Anth 187)  
The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. Prerequisite: Anth 1. (Spring, even years)
- 148 **Primatology** (3) Begun  
(Formerly Anth 188)  
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. Prerequisite: Anth 1. (Fall)
- 150 **Comparative Value Systems** (3) Krulfeld  
World views, conceptual systems, and value orientations of representative cultures throughout the world.
- 151 **Comparative Economic Systems** (3) Krulfeld  
The cross-cultural analysis of economic organizations, including hunters and gatherers, herders, cultivators, and peasants; the relationship of economy to ecology and to other aspects of culture; and the impact of the outside world on these economies.
- 152 **Man, Culture, and Environment** (3) Humphrey  
Basic principles of cultural ecology. Human interaction with the ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems.



- 153 **Psychological Anthropology** (3)  
Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. Prerequisite: Anth 2 or permission of instructor. (Spring) Simons
- 154 **The Anthropology of Law** (3)  
Cross-cultural examination of law and judicial systems. Comparison of processes of adjudication and mediation, including the logic of legal arguments, court procedures, and dispute resolution. Prerequisite: Anth 2 or permission of instructor. (Spring) Caro, Staff
- 155 **Religion, Myth, and Magic** (3)  
Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. Same as Rel 155. (Spring) Simons, Allen
- 156 **Political Anthropology** (3)  
Comparative analysis of political systems, including bands, tribes, chiefdoms, and states. Political processes, such as factionalism, styles of leadership, political ritual, and the wider institutional milieu. Prerequisite: Anth 2 or permission of instructor. (Fall, odd years) Caro, Staff
- 157 **Comparative Kinship and Social Structure** (3)  
Comparative analysis of social patterns and roles in kinship, economic and political organization. Emphasis on preliterate societies, with some attention to complex systems. Prerequisite: Anth 2 or permission of instructor. (Fall) Simons, Allen, Hertz
- 158 **Art and Culture** (3)  
The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. Krulfeld, Humphrey, Allen
- 159 **Symbol, Cognition, and Society** (3)  
The study of culture through the analysis of symbolic systems including myth, cosmology, folklore, art, ritual, political symbolism, and the symbolic study of kinship. Prerequisite: Anth 2 or permission of instructor. (Fall, odd years) Allen, Bragdon
- 161 **Language and Culture** (3)  
Varieties of linguistic structure; the interrelationship of language and culture; the origin and evolution of human language; cultural and social implications of literacy. (Fall) Bragdon
- 162 **Language and Society** (3)  
Linguistic variation and change; social and political correlates of linguistic differences; language in history. (Spring) Staff
- 163 **Anthropology of Visual Communication** (3)  
Still and motion-picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Prerequisite: Anth 2 or permission of instructor. Material fee, \$15. Vlach
- 165-66 **Introduction to Folklore** (3-3)  
Same as AmCv 165-66. Bragdon
- 168 **Methods of Linguistic Analysis** (3)  
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall) Bragdon
- 169 **Intensive Study of a Language** (3)  
Analytic study of a selected language, ordinarily one not frequently studied in a university context (such as an American Indian language), as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer) Lewis, Caro
- 170 **Cultures of the Caribbean** (3)  
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. Prerequisite: Anth 2 or permission of instructor. (Summer) Simons, Humphrey
- 171 **Native Peoples of North America** (3)  
Comparative study of Indian groups representative of each of the continental culture areas. Prerequisite: Anth 2 or permission of instructor. (Fall) (Fall)



- 172 **Cultures of South America** (3) Allen, Caro  
Comparative study of native American, Iberian, and African cultures of South America and their interactions. Emphasis on world view, interethnic relations, and culture change. Prerequisite: Anth 2 or permission of instructor. (Fall)
- 173 **Cultures of the Pacific** (3) Lewis  
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. Prerequisite: Anth 2 or permission of instructor. (Fall, odd years)
- 175 **Topics in Ethnography** (3) Humphrey, Krulfeld  
Intensive study of the ways of life of selected Asian or Circumpolar people. Specific area to be announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: Anth 2 or permission of instructor.
- 177 **Cultures of the Near East** (3) Lewis  
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East: emphasis on the Arab world. Prerequisite: Anth 2 or permission of instructor. (Spring)
- 178 **Cultures of Africa** (3) Lewis, Caro  
Comparative examination of the history, cultural development, and contemporary problems of sub-Saharan African cultures. Prerequisite: Anth 2 or permission of instructor.
- 182 **New World Archaeology** (3) Humphrey  
History of American archaeology; survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. Prerequisite: Anth 3 or permission of instructor. (Spring)
- 183-84 **Old World Prehistory** (3-3) Brooks, Evans  
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. Prerequisite: Anth 3. (Academic year)
- 185 **Archaeology of Mesoamerica** (3) Humphrey  
Culture history of pre-Columbian Mexico and Central America from the Paleo-Indian period through the Spanish Conquest. Prerequisite: Anth 3 or permission of instructor.
- 186 **Archaeology of South America** (3) Allen, McEwen  
Culture history of pre-Columbian South America, with a focus on the Andes from the Paleo-Indian period through the Spanish Conquest. Prerequisite: Anth 3 or permission of instructor.
- 190 **Ethnohistory** (3) Allen, Humphrey, Caro  
Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archaeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*. Same as Hist 190.
- 191 **Anthropology, Drama, and the Human Experience** (3) Garner, Allen  
(Formerly Anth 154)  
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Same as TrDa 140.
- 192 **Development Anthropology** (3) Caro and Staff  
The impact of the world economy on nonindustrial societies. Analysis of the role of anthropology in international development programs aimed at alleviating problems in the Third World. Prerequisite: Anth 2 or permission of the instructor.
- 193 **Field and Laboratory Research in Archaeology** (3) Cressey  
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and en-



- environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*.
- 194 **Introduction to Historical Archaeology** (3) Cressey  
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)
- 195 **Undergraduate Research** (arr.) Staff  
Individual research problems to be arranged with a member of the faculty. May be repeated for credit. Prerequisite: Appropriate introductory course or permission of instructor.
- 196 **Special Topics in Anthropology** (3) Staff  
Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: Anth 2 or permission of instructor.
- 197 **Oral History and Interview Techniques** (3) Staff  
Same as AmCv/Hist 197.
- 198 **Foundations of Anthropology** (3) Allen, Krulfeld, Bragdon  
The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. To be taken in the junior or senior year. Prerequisite: Anth 2 and 3. (Fall)
- 199 **Techniques of Field Research** (3) Staff  
Training in the development of skills necessary for different field situations: urban and rural, at home and abroad, in developing techniques of observation, participation, and documentation, as well as skills in handling practical field situations and problems. Intended primarily for those intending to do field research in the United States or abroad but useful to anyone likely to be living or working in a foreign culture. Prerequisite: Anth 2 or permission of instructor. (Fall)
- 200 **Methods in Sociocultural Anthropology** (3) Krulfeld  
Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. Prerequisite: Anth 2 or permission of instructor. (Spring)

### Third Group

- 201 **Proseminar: Biological Anthropology** (3) Brooks, Gordon  
Theories, methods, and current issues in the various subdisciplines of biological anthropology. (Spring)
- 202 **Proseminar: Sociocultural Anthropology** (3) Krulfeld, Allen  
Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)
- 203 **Proseminar: Anthropological Linguistics** (3) Bragdon, Allen  
Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)
- 204 **Proseminar: Method and Theory in Archaeology** (3) Humphrey, Brooks  
Survey of the most recent archaeological techniques and theoretical approaches to reconstructing and interpreting the cultures of the past. (Fall)
- 211 **Seminar: Problems in Conservation** (3) Rose  
Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)
- 212 **Advanced Conservation Techniques** (3) Rose  
Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)



- 220 **The Anthropology of Development** (3) Krulfeld, Caro  
The role of anthropology in development; emphasis on theoretical perspectives that distinguish the unique contribution of anthropology to understanding processes of change in Third World societies. Issues include land reform, ecological impact, agricultural and pastoral systems, women's roles, migration, political institutions, and proletarianization. The role of anthropology in planning, feasibility studies, and implementation of development projects and policy. (Fall).
- 221 **Key Variables in the Development Process** (3) Caro, Krulfeld  
Major factors required for anthropologists' development work in the areas of population, education, agriculture, irrigation, forestry, nutrition, health care, migration and resettlement, marketing, and communications. Isolation and study of the major variables and processes in each area to aid in successful planning, feasibility study, implementation and evaluation. (Spring)
- 222 **Issues in Development** (3) Krulfeld, Caro  
Topic to be announced in the *Schedule of Classes*.
- 223 **Internship in Development Anthropology** (3) Staff  
Supervised participation in a selected development agency. Opportunity to observe agency procedures and gain practical experience of agency activities. Admission by permission of instructor or department chair. May be repeated for credit. (Fall and spring)
- 254 **Folklore Theory** (3) Vlach  
Same as AmCv 254.
- 255 **Anthropology, Education, and the Museum** (3) Staff  
The role of anthropology in education and museums. Emphasis on current anthropological research and on innovative museum and classroom techniques and materials. Seminars and teaching demonstrations at museums and laboratories.
- 257 **Seminar: American Folklife** (3) Vlach  
Same as AmCv 257.
- 258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Allen, Krulfeld  
Anthropological approaches to aesthetic problems and theories of symbolism in the context of ethnographic materials.
- 259 **Topics in American Folklife** (3) Staff  
A seminar devoted to a variety of subjects related to folklore and folklife, such as public-sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. Same as AmCv 259.
- 260 **Special Topics in Contemporary Anthropology** (3) Staff  
Exploration of a timely theoretical issue, enabling students to keep abreast of significant developments in the field. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.
- 262 **Seminar: Applied Anthropology** (3) Lewis, Caro, Schumann  
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)
- 263 **Seminar: Culture Contact and Change** (3) Simons, Caro  
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)
- 264 **Seminar: Anthropological Museum Techniques** (3) Humphrey  
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)
- 266 **Seminar: Technology** (3) Humphrey, Lewis  
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)



- 267 **Seminar: Economic Anthropology** (3) Caro, Krulfeld  
Comparative study of systems of production, distribution, consumption, political economy and economic change in both preliterate and complex societies.
- 268 **Seminar: Peasant Society** (3) Krulfeld  
Cross-cultural analysis of peasant societies, including their manner of functioning within larger social, economic, and cultural contexts. (Fall)
- 269 **Seminar: Key Issues in Social Organization** (3) Simon  
Current issues in the analysis and interpretation of kinship and political and legal phenomena, with particular emphasis on problems of social and ideological change in developing countries and their effect on sex roles, the family, and social networks. (Spring)
- 272 **Seminar: Topics in Latin American Anthropology** (3) Allen, Caro  
Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archaeological problems.
- 273 **Seminar: Urban Anthropology** (3) Caro  
A review of the literature on urban kin groups, occupational/class and ethnic communities, migrant adaptations; the nature of urbanism; urban poverty; urban field methods. (Spring)
- 274 **Seminar: Topics in American Culture** (3) Here  
Review of anthropological literature on American world view, mainstream and alternate forms of kinship, selected ethnic groups, and the effects of sex, age, class, occupation, and politics on American life. (Fall)
- 282 **Seminar: Advanced Archaeology—New World Prehistory** (3) Humphrey  
Current archaeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.
- 283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archaeology** (3) Brooks  
Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)
- 287 **Seminar: Problems in Latin American Civilization** (3) Stahl  
Same as IAff 287.
- 290 **Advanced Museum Research** (3) Stahl  
Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)
- 291 **Anthropology in the Museum** (3) Humphrey, Evans  
Anthropological materials (in the broadest sense), exhibits, and museums. Topics include museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)
- 292 **Introduction to Conservation** (3) Ros  
Joint offering of the Anthropology and Art Departments. Method and theory of conservation: including fine arts, ethnographic archaeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of museum objects and the ways they react to their environment. The summer course deals with conservation of archaeological materials. (Fall, spring, and summer)
- 293 **Preventive Conservation Techniques** (3) Ros  
Joint offering of the Anthropology and Art Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices; examining objects and documenting their conditions (including photography); and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292. (Spring)



- 294 **Field and Laboratory Research in Archaeology** (3) Cressey, Brooks  
Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. Same fieldwork as Anth 193 but with additional readings and research required. (Summer) Staff
- 295 **Research** (arr.) Staff  
May be repeated for credit. (Fall and spring)
- 298 **Dumbarton Oaks Courses** (arr.)  
Courses offered each year by scholars in residence at Dumbarton Oaks are open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced. May be repeated for credit provided the topic differs.
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

## ART

Professors D.H. Teller, L.F. Robinson (Chair), J.F. Wright, Jr., A.H. Smith, J.L. Lake  
Professorial Lecturers Grace Evans, L. Miller  
Associate Professors H.I. Gates, T. Ozdogan, D.M. Hitchcock, J.C. Anderson, B. von Barghahn, S.B. Molina, W.T. Woodward, C.C. Costigan, M.P. Lader, J.L. Stephanic  
Adjunct Associate Professors Grose Evans, A.D. Ullberg, C.R. Rose  
Associate Professorial Lecturers D. Von Endt, D.C. Lynn, D. Srinivasan, J.G. Kauffman  
Assistant Professors F. Griffith, K.J. Hartswick  
Assistant Professorial Lecturers E.P. Lawson, A.B. Barnhart, C. Smigrod, B.G. Carson, C.R. Smith, M.J. Francis, J.F. Harrop, B.R. Stevens, R. Schanzer, R. Rodriguez, J. Paradiso, C.S. Rose, A.C. Palumbo, R. McCleary, M. Dennis, W.W. Scott, C.D. Hickok, J.R. Spencer  
Curator, Dimock Gallery L.D. Miller

**Bachelor of Arts with a major in art history (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Art 31-32 and 71 or 72.
3. Required courses in related areas—Art 137; Fren 1-2-3, 4, or Ger 1-2, 3-4.
4. Required courses in the major—Art 101 and 102, 104 or 105, 106 or 107, 108, 109 or 110, 113 or 114, 117 or 118, 129; 9 additional semester hours in second-group art history courses.
5. A maximum of 9 semester hours in fine arts, including Art 137, is permitted.

**Bachelor of Arts with a major in fine arts (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. A total of 51 hours of art courses is required of fine arts majors except for students with a concentration in photography, for whom 54 hours are required.
3. Required basic fine arts courses: Art 21-22 and 41-42.
4. Required courses in art history: Art 31-32; 6 additional semester hours in second-group art history courses.
5. Required fine arts courses in the major:
  - a. 12 hours, exclusive of primary area of concentration, in four of the following eight areas—ceramics, advanced drawing, advanced design, printmaking, painting, photography, sculpture, and visual communication.
  - b. 15 hours to be taken in the primary area of concentration (except for photography and visual communication).
  - c. 18 hours for students concentrating in photography: Art 23, 24, 181, 182, 205, 206.



6. Nine additional hours of electives may be taken in the Art Department, except for students concentrating in photography, who take only 6 hours of electives in the Art Department.

7. Transfer students must take at least 12 semester hours of second-group fine arts courses and 9 semester hours in their area of specialization at this University.

*Bachelor of Arts with a combined major in art history and fine arts*—The following requirements must be fulfilled in consultation with the departmental advisor:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. A total of 30 hours in art history and 30 hours in fine arts.
  - a. Art history: Art 31–32, 71 or 72, and one course in each of the following areas—ancient, medieval, Renaissance, seventeenth and eighteenth centuries, nineteenth and twentieth centuries; 6 hours of art history electives.
  - b. Fine arts: Art 21–22, 41–42. The remaining 18 hours may be in one area of concentration or a combination of areas.

*Special Honors*—For graduation with Special Honors, students must have attained a quality-point index of at least 3.5 in the major and 3.0 overall. No later than the beginning of the senior year, students should consult their advisor regarding eligibility and selection of an area of study and a director of the research or creative arts project.

*Bachelor of Arts/Master of Arts in the field of art therapy*—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

*Bachelor of Arts with a major in classical archaeology and anthropology (departmental)*—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible.
3. Required courses in the major: Anth 3, 183–84, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 107, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

*Bachelor of Arts with a major in classical archaeology and classics (departmental)*—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin (a reading knowledge of French and German is recommended).

*Minor in Art History*—Required: 18 semester hours of courses in art history. Declaration of the minor must be made after completion of no more than 9 hours in art history. Specific areas of concentration (ancient/medieval, Renaissance/Mannerism, Baroque/eighteenth century, nineteenth century/modern, primitive/pre-Columbian, Oriental/Islamic, Hispanic) are determined upon consultation with the undergraduate advisor for Art History.

*Minor in Fine Arts*—Required: 18 semester hours of general course work in fine arts or in an area of concentration selected from design, drawing, ceramics, photography, painting, printmaking, sculpture, or visual communication. Students in the general program should consult the undergraduate fine arts advisor. Those selecting a specific area should consult with an advisor in the area of concentration.

*Combined Minor in Art History and Fine Arts*—Required: 9–12 hours of course work in art history; 9–12 hours in fine arts. Declaration of a combined minor must be made after



completion of no more than 6 hours in art history and 6 hours in fine arts. A program of study is developed in consultation with the undergraduate advisors in art history and fine arts.

*Master of Arts in the field of art history*—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archaeology, medieval art, Renaissance and Baroque art, eighteenth- and nineteenth-century art, contemporary art, or American art*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 30 semester hours of course work including 6 hours of thesis research. As many as possible of the 30 semester hours of course work should be in third-group courses; not more than 6 hours may be taken in museum-related courses. Students are required to take a seminar in each of the following areas: classical, medieval, Renaissance, Baroque, modern, and American. Students must maintain a quality-point index of at least 3.0. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the 6 semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 36 semester hours of course work, including 12 hours of internship credit (Art 201-2 and 271-72). As many as possible of the 36 hours of course work should be in third-group courses. Students are required to take a seminar in each of the following areas: classical, medieval, Renaissance, Baroque, modern, and American. Six hours of electives in art history or in museum-related courses are selected in consultation with the graduate advisor. Students must maintain a quality-point index of at least 3.0. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in art history and may also be required to pass a written comprehensive examination in museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

*Master of Fine Arts in the field of ceramics, design, printmaking, painting, photography, sculpture, or visual communication*—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in fine arts in the field of ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication. A 3.00 undergraduate grade point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slide examples of work in the area of application as well as slides of representative works in other areas. Students planning to do graduate work in printmaking or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A minimum of 45 semester hours of course work in fine arts is required; the number of required hours is determined in consultation with an advisor. As much as possible of the course work should be in third-group courses, only 18 hours of which may be in one area; 6-9 hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication will be completed under the supervision of a thesis advisor. In addition, the thesis must



include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader.

*Doctor of Philosophy in the field of art history*—Required: the general requirements stated under the Graduate School of Arts and Sciences, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German and General Examinations in one major area of specialization and two other areas of specialization. Language examinations should be completed within the first academic year of course work. Programs are planned in consultation with a departmental committee.

*Research fields:* Nineteenth- and twentieth-century European art and American art.  
*Supporting fields:* Classical art and archaeology, early Christian and Byzantine art, Northern Renaissance art, and Baroque art.

## ART HISTORY

### First Group

- 1 **Principles of Art** (3) von Barghahn  
 An introduction to various art media, basic elements of art and thematic interpretations, European and non-Western traditions. (Fall and spring)
- 31-32 **Survey of Western Art** (3-3) Robinson and Staff  
 A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to modern art. (Art 31 and 32—fall and spring)
- 71-72 **Introduction to the Arts in America** (3-3) Grubar and Staff  
 Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

### Second Group

- 101 **Greek Art and Archaeology** (3) Hartswick  
 A survey of Greek sculpture, painting, and architecture, from the Dark Ages (ca. 1000 B.C.) through Alexander the Great (ca. 300 B.C.). Emphasis is on the stylistic development of Greek art and the interrelationships among sculptural technique and style, major changes in vase painting, and the refinements of architectural elements. (Fall)
- 102 **Roman Art and Archaeology** (3) Hartswick  
 A survey of Roman sculpture, painting, and architecture, from 300 B.C. (the Etruscans) to the end of the Constantinian Period (ca. 300 A.D.). The major artistic achievements of the Romans—portraiture, historical narratives—and the stylistic changes from the idealized and illusionistic to the realistic and abstract. (Spring)
- 103 **The Ancient Artist and His Workshop** (3) Hartswick  
 A study of the ancient craftsman's techniques, workshop organization, and position in society. Exploration of sculpture, architecture, painting, pottery, mosaics, gems, glass, and metalwork.
- 104 **Renaissance Art in Italy I** (3) Grace Evans  
 Early developments from the 13th to the 15th century. (Fall)
- 105 **Renaissance Art in Italy II** (3) Grace Evans  
 High Renaissance and Mannerism. (Spring)
- 106 **Renaissance Art in the North I** (3) Hitchcock  
 Northern painting from van Eyck through Bosch. (Fall)
- 107 **Renaissance Art in the North II** (3) Hitchcock  
 Northern painting and graphics from Durer through Brueghel. (Spring)
- 108 **18th-Century Art in Europe** (3) Hitchcock  
 Painting, sculpture, and architecture in France, Great Britain, and Italy. Emphasis on Watteau, Chardin, David, Hogarth, Gainsborough, Reynolds, Canaletto, and Tiepolo. (Spring)



- 109 **19th-Century Art in Europe I** (3) Robinson  
Examination of Neoclassicism and Romanticism in the context of Western European historical and cultural developments. Emphasis on France, England, and Germany and the representative styles of David, Ingres, Delacroix, Turner, Constable, and Friedrich. (Fall)
- 110 **19th-Century Art in Europe II** (3) Robinson  
Examination of the revolution in style of Realism, Impressionism, and Post-impressionism in the context of Western European political, social, and cultural developments. Emphasis on representative styles of Courbet, Manet, Monet, Cezanne, Van Gogh, and Gauguin. (Spring)
- 111 **Classical Archaeology** (3) Hartswick  
Archaeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.
- 112 **Egypt and the Near East** (3) Hartswick  
The great artistic tradition of the Nile Valley and the contemporary civilizations (ca. 3000 B.C. to after 1000 B.C.) between the rivers Tigris and Euphrates (present day Iraq) are explored. Emphasis on the Pyramid Age, the temples at Karnak and Luxor, the tombs of the Valley of the Kings, and the artistic traditions of the Sumerians, Akkadians, Babylonians, Assyrians, and Persians. (Fall)
- 113 **Baroque Art in Italy** (3) Grose Evans  
(Spring)
- 114 **Baroque Art in the North** (3) Hitchcock  
Concentration on France, Flanders, and Holland, with emphasis on Poussin, Rubens, Van Dyck, and Rembrandt. (Fall)
- 115 **Christian Iconography** (3) Grace Evans  
Origins and development of Christian symbols and themes from early Christian to the Council of Trent.
- 116 **Islamic Art** (3) Staff
- 117 **Medieval Art I** (3) Anderson  
Early Christian and Byzantine. (Fall)
- 118 **Medieval Art II** (3) Anderson  
Romanesque and Gothic. (Spring)
- 119 **Islamic Religion and Art** (3) Nasr  
Same as Rel 163.
- 120 **East Asian Art** (3) Srinivasan  
May be repeated for credit when content differs.
- 121 **Spanish Art I** (3) von Barghahn  
Discussion of areas selected from the art of ancient Iberia through the seventeenth century. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.
- 122 **Spanish Art II** (3) von Barghahn  
Discussion of areas selected from the eighteenth through twentieth centuries. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.
- 129 **20th-Century Art in Europe** (3) Lader  
Survey of 20th-century European painting, sculpture, and architecture, from their origins in the late 19th century through Surrealism. Emphasis on major modernist movements and artists, including Matisse, Picasso, Kandinsky, and Mondrian. (Fall)
- 130 **20th-Century American Art** (3) Lader  
Survey of 20th-century American painting and sculpture, focusing upon the avant-garde. Emphasis on artists of the Stieglitz circle and later modernist movements such as Abstract Expressionism, Pop, Op, Minimal, and Conceptual art. (Spring)
- 140 **Gothic Architecture** (3) Staff
- 145 **Folk Arts in America** (3) Grubar  
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.



- 147 **Primitive Art I: Ancient Civilizations of Mexico and Latin America** (3) von Barghahn  
Survey of Pre-Columbian art and architecture from prehistoric period to the Spanish conquest, including Yucatan and Central American regions.
- 148-49 **19th-Century American Painting and Sculpture** (3-3) Grubar  
Fall: 1800-1860; spring: 1860-1900. (Academic year)
- 150 **Landmarks in American Art** (3) Grubar
- 155 **Aegean Civilizations** (3) Hartwick  
An introduction to the excavational and multidisciplinary aspects of classical archaeology. Minoan and Mycenaean civilizations (1700-1200 B.C.). Interrelationships between Greek and Persian cultures of the sixth and fifth centuries B.C. (Spring)
- 156 **Early Medieval Sculpture** (3) Grace Evans
- 161 **Studies in Renaissance Art** (3) Grace Evans
- 162 **Principles of Museum Work** (3) Lawson  
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.
- 165 **Primitive Art II: African, Oceanic, North American Indian** (3) von Barghahn  
Survey of architecture, sculpture, and painting from ancient kingdoms to early 20th-century culture. Emphasis on imagery and iconography.
- 167 **The Dynastic Courts of Europe** (3) von Barghahn  
Politics and royal patronage, 1400-1800. Areas may include France, Italy, Spain, Portugal, Austria, Germany, or Russia. Specific area announced in Schedule of Classes. May be repeated for credit if specific area is different.
- 169 **History of Decorative Arts: European Heritage** (3) Carson  
Survey of changing styles of European furniture, textiles, ceramics, and glass, in the context of general trends in art history and changing patterns in economic, technological, social, and cultural history. From antiquity to the modern age. (Fall)
- 170 **History of Decorative Arts: American Heritage** (3) Carson  
Examination of the decorative arts in America from the 17th century to the modern period. Exploration of changing visual characteristics in relation to the changing American experience. (Spring)
- 173 **History of the Cinema** (3) Staff  
Same as Comm 173. Laboratory fee, \$25.
- 176 **American Architecture** (3) Longstreth  
Same as AmCv/U&RP 175.
- 187 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy  
Same as Engl/Fren/Ger/Hist/Rel 183.
- 191 **American Architecture** (3) Longstreth  
Same as AmCv/U&RP 176.
- 192 **The American Cinema** (3) Staff  
Same as AmCv 192.
- 197 **History of Photography** (3) Lader
- \*198 **Proseminar in Art History** (3) Staff  
(Formerly History of Photography: The 20th Century)

### Third Group

- 201-2 **Museum Projects** (3-3) Staff  
Open only to candidates for the degree of Master of Arts in the field of art history with a concentration in museum training.

\* Specific area announced in the Schedule of Classes. May be repeated for credit if the specific area covered is different.



- 203 **Primitive Art** (3) von Barghahn  
(Spring)
- 207 **Modern Architecture** (3) Lader  
Europe and America.
- 211 **Seminar: Problems in Conservation** (3) Rose  
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)
- 212 **Advanced Conservation Techniques** (3) Von Endt  
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)
- 216 **Medieval Painting** (3) Grace Evans  
Painting and the decorative arts.
- 217-18 **Problems in Museum Work** (3-3) Ullberg  
Art 217 is prerequisite to Art 218.
- \*220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock  
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)
- \*221 **Seminar: Renaissance Art** (3) Staff  
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)
- \*+243 **Seminar: American Art** (3) Grubar  
(Fall and spring)
- \*+244 **Seminar: 19th-Century European Art** (3) Robinson  
Reading knowledge of French desirable.
- \*+245 **Seminar: 20th-Century European Art** (3) Lader
- \*246 **Seminar: Classical Art** (3) Hartswick
- \*247 **Proseminar: Medieval Art and Archaeology** (3) Anderson
- 248 **Independent Research in Art History** (3)  
(Fall and spring)
- \*261 **Seminar: Problems in Art History** (3) Staff
- 271-72 **Museum Techniques** (3-3) Staff  
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)
- 284 **Seminar: Studies in American Art and History** (3) Staff  
Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)
- 289-90 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 292 **Introduction to Conservation** (3) Rose  
Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archaeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

\* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.

† Laboratory fee, \$15 when course is taught off campus.



**293 Preventive Conservation Techniques (3)**

Interdepartmental course offered by the Art and Anthropology Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices, examining objects and documenting their conditions (including photography), and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292.

Rose

**Fourth Group**

Limited to art history doctoral candidates. Offered as the demand requires. May be repeated for credit.

**385-86 Readings in Art History (3-3)****398 Advanced Reading and Research (arr.)**

For students preparing for the doctoral examination.

**399 Dissertation Research (arr.)****FINE ARTS****First Group****21-22 Design I: Basic (3-3)**

Required of all Fine Arts majors. Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, \$15. Art 22: Laboratory fee, \$21. (Art 21 and 22—fall and spring)

Costigan, Teller

**23 Photography I: Introduction (3)**

Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, \$54. (Fall and spring)

Lake and Staff

**24 Photography II (3)**

Continuation of Art 23. Experimentation with black and white films and developers. Improvement of printing and exposure techniques. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, \$54. (Fall and spring)

Stephanic

**41-42 Drawing I (3-3)**

Elementary investigation of concepts of drawing, both traditional and contemporary; training in perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in connoisseurship. Material and model fee, \$60 per semester. (Art 41 and 42—fall and spring)

Wright and Staff

**51 Introduction to Handbuilt Ceramics (3)**

Working with clay as an art form. Exploration of pinch, coil, slab, hump and press mold, paddling, and hollowing techniques. Sketch studies, reduction and oxidation kiln firings, clay and glaze making. Laboratory fee, \$57, including unlimited materials and use of tools. (Fall and spring)

Ozdogan and Staff

**52 Introduction to Wheelthrown Ceramics (3)**

Development of cylindrical and open forms. Trimming, clay and glaze making, reduction and oxidation kiln firings. Sketch studies. Laboratory fee, \$57, including unlimited materials and use of tools. (Fall and spring)

Ozdogan and Staff

**57 Printmaking: Introduction to Relief and Planographic Techniques (3)**

Exploration in monochrome and color of basic methods of these techniques, i.e., woodcut, composite relief, monotype, and lithography. Emphasis on aesthetic qualities of prints. Laboratory fee, \$36. (Fall)

Griffith

**58 Printmaking: Introduction to Intaglio and Stencil Techniques (3)**

Exploration in monochrome and color of basic methods of these techniques, i.e., etching, engraving, collograph, stencil, and composite intaglio. Laboratory fee, \$36. (Spring)

Griffith



- 61-62 **Water Color** (3-3) Staff  
Painting in transparent and opaque water color and in acrylic. Experimentation, figurative, and landscape. Laboratory fee, \$15 per semester. (Academic year)
- 65-66 **Painting I** (3-3) A. Smith and Staff  
Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Material and model fee, \$39 per semester. (Academic year)
- 81-82 **Sculpture I** (3-3) Gates and Staff  
Beginning study of design and fabrication of sculpture. Basic sculptural techniques for media, including clay, plaster, stone, and wood. Laboratory fee, \$24 per semester. (Academic year)

## Second Group

Second-group art courses may be repeated for credit with approval of the department.

- 123-24 **Individual Problems** (3-3) Staff  
Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen. \* Prerequisite: permission of instructor. (Academic year)
- 125-26 **Painting II** (3-3) A. Smith  
Alteration of personal expression and structured problems dealing with still life and the figure. Use of acrylic and oil. Material and model fee, \$39 per semester. (Academic year)
- 127-28 **Painting III** (3-3) Woodward  
Studies in the interpretation of the figure and still life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material and model fee, \$39 per semester. (Academic year)
- 131 **Intermediate Ceramics:** Ozdogan and Staff  
**Wheelthrown Functional Forms** (3)  
Aesthetic and technical development of wheelthrown functional ceramic forms. Exploration of attachments: lids, spouts, handles, and footing devices. Sketches and technical drawings, clay and glaze-making tests, varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, \$57. (Fall and spring)
- 132 **Intermediate Ceramics:** Ozdogan and Staff  
**Wheelthrown Nonfunctional Forms** (3)  
Aesthetic and technical development of wheelthrown ceramic sculptural forms. Emphasis on section throwing, closed forms, and construction. Varied temperature firings in oxidation and reduction atmospheres. Clay and glaze making. Laboratory fee, \$57. (Fall and spring)
- 133 **Ceramic Decoration** (3) Ozdogan  
Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, \$57. (Fall)
- 134 **Nonsilver Printing Processes in Photography** (3) Smigrod  
Introduction to nonsilver and archaic photographic processes. At least three processes will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, \$57. (Spring)
- 135-36 **Advanced Water Color** (3-3)  
Development of techniques of water color; concentration on special projects. Laboratory fee, \$15 per semester. (Academic year)

\* Schedule of Fees: Ceramics—\$57; 2-D Design—none; 3-D Design—\$24; Drawing—\$60; Printmaking—\$36; Sculpture—\$24; Typography—\$54; Painting—none; Photography—\$54; Visual Communication—\$54; Lithography—\$36; Serigraphy—\$21.



- 137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, A. Smith, and Staff  
Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, \$15. (Fall and spring)
- 138 **Printmaking: History and Practice** (3) Griffith  
Lecture survey through slides and original prints of the history of the fine art etching, engraving, woodcut, stencil, and lithograph. Laboratory demonstrations with student participation. This basic course is designed for artists, art historians, art dealers, appraisers, librarians, commercial artists, and collectors. There is no prerequisite. Laboratory fee, \$24. (Summer)
- 139 **Design in Fiber** (3) Costigan  
Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Laboratory fee, \$9.
- 141 **Interior Design** (3) Teller  
Survey of basic interior design materials and techniques. Topics include floor plans and design, interior renderings, hard and soft materials, furniture styles. Laboratory fee, \$21. (Fall)
- 142 **Interior Design Problems** (3) Teller and Staff  
A theoretical and practical in-depth exploration of a specific area of interior design selected from furniture design, construction and restoration, history of furnishings, and interior rendering. Topic to be announced in the Schedule of Classes. Prerequisite: Art 141 or equivalent. Laboratory fee, \$21. (Spring)
- 143-44 **Serigraphy** (3-3) Teller  
Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Laboratory fee, \$21 per semester. (Academic year)
- 146 **Ceramic Restoration** (3) Ozdogan  
Methods and techniques for museum and commercial application. Laboratory fee, \$57. (Summer)
- 151 **Ceramic History and Technology** (3) Ozdogan and Staff  
A survey of the history of ceramics and its technology. Lectures, demonstrations, and supplemental programs. Laboratory fee, \$21. (Fall)
- 152 **Ceramic Sculpture** (3) Ozdogan  
Developing an understanding of the sculptural ceramic form that integrates both quality and creativity. Techniques in hollow and solid construction. Varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, \$57. (Fall)
- 153 **Printmaking: Intermediate Study of Intaglio and Relief Techniques** (3) Griffith  
Investigation in monochrome and color of these techniques, i.e., etching, engraving, woodcut, wood engraving, stencil, composite processes, and mixed media. Prerequisite: Art 57, 58. Laboratory fee, \$36. (Fall)
- 154 **Printmaking: Introduction to Light-Sensitive Grounds** (3) Griffith  
Exploration of the use of grounds on copper that are sensitive to light for the purpose of etching. Printing in monochrome and color. Prerequisite: Art 153 or equivalent. Laboratory fee, \$36. (Spring)
- 157-58 **Printmaking: Advanced Study of Intaglio and Relief Techniques** (3-3) Griffith  
Intensive exploration in monochrome and color of printmaking: etching, engraving, woodcut, wood engraving, stencil, collograph printing with light-sensitive grounds, composite techniques, and mixed media. Emphasis on utilization of techniques in developing a personal statement and style. Prerequisite: Art 153, 154, or equivalent. Laboratory fee, \$36. (Fall and spring)
- 159-60 **Drawing II** (3-3) Wright and Staff  
Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Material and model fee, \$60 per semester. (Academic year)



- 163 **Visual Communication I: Basic Layout** (3) Molina and Staff  
Layout stages, including basic formats, production processes; working with type and basic skills. Prerequisite: Art 171. Laboratory fee, \$54.
- 164 **Visual Communication II: Problem Solving** (3) Molina and Staff  
Conceptual approach to problem solving. Various graphic design problems, including both small-format and large-format design in commercial and institutional graphics. Prerequisite: Art 163, 172. Laboratory fee, \$54.
- 166 **Advanced Drawing Techniques** (3) A. Smith and Staff  
Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Laboratory fee, \$36.
- 168 **Intermediate Ceramic Design in Handbuilding** (3) Ozdogan  
Further concentration in handbuilding techniques of pinch, coil, slab, hump and press mold, paddling, and hollowing. Sketch studies, clay and glaze tests. Orientation to studio operations and maintenance. Laboratory fee, \$57. (Fall and spring)
- 171 **Typography I** (3) Molina and Staff  
Basic calligraphy for traditional and contemporary use. Type theory, including specification, copy fitting, and study of letter form as used in graphic design. Laboratory fee, \$54.
- 172 **Typography II** (3) Molina and Staff  
Study of type classification, recognition, and adaptation. Methods of type specification, copy fitting, and typesetting processes. Typographic layout and alphabet design. Prerequisite: Art 171. Laboratory fee, \$54.
- 174 **Visual Communication III: Computer Graphics Seminar** (3) Molina and Staff  
Introduction to computer graphics for art majors. The use of computers in the design process and as a tool for problem solving in graphic design. Laboratory fee, \$54.
- 175 **Printmaking: Introduction to Lithography** (3) Barnhart  
Study of techniques and materials related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Laboratory fee, \$36.
- 177-78 **Survey of Printing and Illustration** (3-3) Staff  
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)
- 179-80 **Sculpture II** (3-3) Gates  
Expansion of Sculpture I, utilizing advanced wood milling equipment and metal welding techniques. Prerequisite: Art 81-82. Laboratory fee, \$24.
- 181 **Introduction to Color Photography** (3) Lake  
Introduction to color through exposure and processing of color transparency films. Use of filters for creating and correcting color shifts, with emphasis on color as subject matter. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, \$54. (Fall)
- 182 **Introduction to Photographic Lighting** (3) Stephanic  
Introduction to various lighting techniques. Available light manipulation, studio lighting, and copy lighting will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, \$54. (Fall and spring)
- 183 **Experimental Photography** (3) Staff  
Structured exploration of various photographic processes and techniques. Emphasis on creative expression. Content of course will vary; contact department for current offering. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, \$54. (Fall and spring)
- 184 **Jewelry Design and Techniques** (3) Gates  
Laboratory fee, \$24. (Summer)



- 185-86 **Portrait Painting and Drawing** (3-3) C. Smith  
Fall: Various media; drawing and pastel. Spring: Oil. Model fee, \$45 per semester. Gates
- 189-90 **Sculpture III** (3-3)  
Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179-80. Laboratory fee, \$24 per semester. (Academic year) Staff
- 193 **Film Making I** (3)  
Introduction to the basic techniques and procedures for film making. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, \$54. (Fall and spring) Staff
- 194 **Film Making II** (3)  
Continuation of Art 193 with more advanced projects. Prerequisite: Art 193 or permission of instructor. Laboratory fee, \$54. (Fall and spring) Staff
- 195 **Documentary Photography** (3)  
Historical development of documentary photography. Completion of two projects required. Laboratory fee, \$54. Prerequisite: Art 23 and 24 or permission of instructor. Same as Jour 195. (Fall) Staff

### Third Group

All third-group art courses may be repeated for credit with the approval of the department.

- 205 **Advanced Photography: Zone System Tests** (3) Lake  
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, \$54. (Fall and spring)
- 206 **Advanced Photography: Color Printing and Zone Proofs** (3) Lake  
Printing from color negatives. Correct color balancing and creative color shifts will be explored. Development of portfolio of prints utilizing approved theme and the exposure and development times established in Art 205. Prerequisite: Art 181 or 205, as determined by instructor. Laboratory fee, \$54. (Fall and spring)
- 208 **Advanced Photography: Special Projects** (3) Lake and Stephanic  
Independent projects requiring approval prior to registration. Prerequisite: Art 181 and 182, or permission of instructor. Laboratory fee, \$54. (Fall and spring)
- 209-10 **Exhibition and Display Design** (3-3) Miller  
224 **Advanced Ceramic Sculpture** (3) Ozdogan  
Continuation of Art 152 with emphasis on individual approach. Exploration of mixed media and mold casting. Laboratory fee, \$57. (Fall)
- 225 **Advanced Ceramic Decoration** (3) Ozdogan, Smith  
Perfection of decorating techniques. Students establish style through independent exploration. Laboratory fee, \$57. (Spring)
- 226 **Architectural Ceramics** (3) Ozdogan  
Advanced studies in ceramic murals and sculptures designed for indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, \$57. (Spring)
- 231-32 **Design III** (3-3) Gates  
New media and techniques in three-dimensional design. Laboratory fee, \$24 per semester. (Academic year)
- 234 **Design IV: Jewelry Design** (3) Gates  
Theory and fabrication of jewelry using basic metal techniques, assemblage approach, and lost-wax casting. Laboratory fee, \$30. (Fall and spring) Teller
- 235 **Design V: Textile Printing** (3)  
Designing and executing textiles using the techniques of silk screen, block print and batik. Laboratory fee, \$21. (Fall and spring)
- 248 **Independent Research in Fine Arts** (3)  
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with indi-



vidual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.\* (Fall and spring)

- 249 **Theory of Design** (3) Costigan  
Application of design principles to problems of the artist in all disciplines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all M.F.A. candidates and to seniors with permission of instructor. Laboratory fee, \$9.
- 251 **Advanced Ceramic Design in Wheel Throwing** (3) Ozdogan  
Individual projects on the potter's wheel. Student establishes personal style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays, glazes, and firings is required. Laboratory fee, \$57. (Fall and spring)
- 252 **Advanced Ceramic Design in Hand Building** (3) Ozdogan  
Individual projects in hand building. Student establishes style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays and glazes is required. Laboratory fee, \$57. (Fall and spring)
- 253 **Industrial Ceramic Design/Mold Making** (3) Ozdogan  
Study in the multiple production process from model making to finished duplicate form as it exists on factory level. Methods include all aspects of model designing and making in clay and plaster; mold making in plaster; production methods from molds including press molding, slip casting, jiggering, and jolly-ing. Laboratory fee, \$57. (Fall and spring)
- 254 **Ceramic Glazes: Calculation and Formulation** (3) Staff  
Laboratory fee, \$21.
- 255-56 **Printmaking: Advanced Serigraphy** (3-3) Teller  
Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 143-44. Laboratory fee, \$21 per semester. (Academic year)
- 257-58 **Printmaking: Etching and Engraving** (3-3) Griffith  
Advanced problems in etching and engraving, including composite processes, light-sensitive grounds, mixed media, and theoretical and practical problems of color prints. Laboratory fee, \$36. (Fall and spring)
- 259 **Printmaking: Advanced Lithography** (3) Barnhart  
Individual problems in lithography related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Emphasis on mastering the lithographic process and developing a personal statement and style. Laboratory fee, \$36.
- 260 **Printmaking: Relief Printing** (3) Griffith  
Advanced problems, practical and theoretical, in woodcut, wood engraving, collograph, composite techniques, and mixed media in monochrome and color. Laboratory fee, \$36. (Fall and spring)
- 265-66 **Painting IV** (3-3) Woodward  
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, \$39 per semester. (Academic year)
- 267-68 **Individual Problems in Photography** (3-3) Stephanic  
Limited to M.F.A. candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, \$54 per semester. (Academic year)
- 275 **Painting V** (3) Woodward  
Development of personal imagery. Individual problems and critiques. Material and model fee, \$39.

\* Schedule of Fees: Ceramics—\$57; 2-D Design—none; 3-D Design—\$24; Drawing—\$60; Printmaking—\$36; Sculpture—\$24; Typography—\$54; Painting—none; Photography—\$54; Visual Communication—\$54; Serigraphy—\$21; Lithography—\$36.



- 277 **Advanced Visual Communication: Packaging Design and Illustration** (3) Molina  
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, \$36. (Fall and spring)
- 278 **Advanced Visual Communication: Problem Solving and Applied Design** (3) Molina  
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, \$36. (Fall and spring)
- 279-80 **Sculpture IV** (3-3) Gates  
Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, \$24. (Academic year)
- 281 **Sculpture V** (3) Gates  
Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, \$24. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
Laboratory fee depending on area chosen.\* (Fall and spring)

#### ART THERAPY—GRADUATE PROGRAM

Adjunct Professor E. Ulman

Adjunct Associate Professor E. Kramer

Assistant Professor K.J. Williams (Program Director)

Adjunct Assistant Professors W. Maiorana, A.J. DiMaria, A. Corson, C.T. Cox

Clinical Instructors B.K. Mandel, N.J. Schoebel, N.J. Miller, M.M. Eife, J.P. Torrenzano, T. Tripp

Lecturers P. Howie, B. Barthell

Master of Arts in the field of art therapy—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements stated under the Graduate School of Arts and Sciences and successful completion of 36 credit hours of graduate course work. At least 24 credit hours must be in art therapy and must include ArTh 201, 203, 205-6 or 207 and 208, 224, 226, and 283-84.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

Bachelor of Arts/Master of Arts in the field of art therapy—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. The first three years of the program consist of undergraduate course work. Application for admission to the M.A. program in art therapy will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance to the M.A. program in art therapy is not desired or not obtained, the requirements for the B.A. degree in the undergraduate field chosen may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.A. program in art therapy is obtained, the B.A. will be awarded after the successful completion of the fourth year of the program. Study during the summer following the award of the bachelor's degree and the following academic year would normally complete the M.A. degree requirements.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences.
2. The course requirements for the B.A. in either fine arts or psychology and for the M.A. in art therapy must be met.

\* Schedule of Fees: Ceramics—\$57; 2-D Design—none; 3-D Design—\$24; Drawing—\$60; Print making—\$36; Sculpture—\$24; Typography—\$54; Painting—none; Photography—\$54; Visual Communication—\$54; Serigraphy—\$21; Lithography—\$36.



- 201 **Introduction to Art Therapy** (3) DiMaria  
Lectures, presentation of illustrative case material, class discussion of assigned readings, field work. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to art therapy degree candidates. (Fall)
- 202 **Case Studies in Art Therapy** (3) DiMaria  
Discussion of case material provided by students in order to refine methods of working and to improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)
- 203 **Technique of Art Therapy** (3) Williams  
Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to art therapy degree candidates. (Fall)
- 204 **Psychodynamic Processes in Art Therapy** (3) Kramer  
Concepts of instinctual drives; ego development; mechanisms of defense; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)
- 205-6 **Family Art Techniques** (3-3) Howie and Staff  
Principles of work with families, with emphasis on the use of art techniques for evaluation of family dynamics. The major focus is on opportunities to conduct and observe family art evaluations. Enrollment is limited to 12. Prerequisite: ArTh 201, 203. Open to art therapy degree candidates only. (Fall and spring)
- 207 **Art as Therapy with Children** (3) Maiorana  
Introduction to the practical and theoretical considerations involved in art as therapy with children. Focus on psychodynamics, artistic developmental stages, methods of child art evaluation, and basic issues in therapeutic guidance of the child. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Fall)
- 208 **Art Therapy with Adolescents** (3) Corson  
Theoretical and practical issues in art therapy with adolescents in educational and clinical settings. Experiential work in art techniques appropriate to this population. Class discussion of readings on adolescent development. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)
- 211 **Survey of Art Therapy** (3) Barthell  
Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. Not intended for art therapy degree candidates. Open to advanced undergraduates with permission of instructor. (Fall)
- 224 **Process of Art Therapy** (3) Maiorana, Williams  
Exploration of the treatment process through discussion of literature from art therapy and related fields. Several critical papers will be required. Must be taken concurrently with ArTh 226. (Spring)
- 226 **Process of Art Therapy** (3) Maiorana, Williams  
Exploration of the treatment process through rehearsal of fundamental ways of being a therapist and presentation of case material from field experience. Video- and audiotaping required. Must be taken concurrently with ArTh 224. (Spring)
- 275 **Group Art Therapy** (3) Williams  
Experience as participant, observer, and leader in an art-centered group; required reading; theory of group process. Open to art therapy master's degree candidates and others with permission of instructor. (Summer)
- 283-84 **Practicum in Art Therapy** (3-3) Staff  
Minimum of 300 hours field work per semester connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203. Open only to art therapy degree candidates.



- 285 **Special Projects in Art Therapy** (arr.)  
Individual work based on research. Empirical, clinical, and library research may be undertaken, as well as the development of new procedures. Details to be worked out with each student. May be repeated for credit with advisor's approval. Open only to degree candidates. (Fall and spring) Staff
- 289 **Special Topics in Art Therapy** (1 to 3)  
Connections between art therapy and other disciplines; new developments in the field. May be repeated for credit with approval of advisor. Open to art therapy degree candidates and others with permission of instructor. Staff
- 290 **Workshops in Art Therapy** (3)  
Art therapists and other mental health professionals will conduct four weekend workshops during the semester. Emphasis on the elucidation of concepts of treatment through lectures, discussion, and participation. (Fall) Staff
- 298 **Reading and Research** (1 to 3)

#### **ASSOCIATION MANAGEMENT—GRADUATE PROGRAM**

See the School of Government and Business Administration for the program of study leading to the degree of Master of Association Management.

- 270 **The Association: Roles, Influence** (3)  
Introduction to the Association Management Program; development and nature of interest representation; its history; varieties of associations and their roles and functions; legal constraints, responsibilities, and ethics. (Fall and spring) Keane
- 271 **Marketing Management for Associations** (3)  
Market analysis, product planning, channels of distribution, pricing, and promotional decision making are presented, with particular application to associations. Topics include membership recruitment; fees, dues, and other monetary issues; physical location of the association; staff-membership contacts; promotion of association goals. (Fall) Staff
- 272 **Communications and Media Relationships for Associations** (3)  
Primarily for students in association management. The nature of the communication process, including both interpersonal and organizational communication. Problems and approaches; barriers to good communication. Methods of improving organizational communication. The media and their role; approaches to media relationships. (Spring) Kasle, Adams
- 273 **Association Law and Lobbying** (3)  
The role of the association in the political process, including the context within which interests are represented before Congress and the executive branch. Interest groups and their ideas and techniques. Rules and regulations governing lobbying activities. (Spring) Staff
- 274 **Marketing Strategy for Associations** (3)  
Analysis of complex marketing problems of associations that involve policy and operational decisions. Creative marketing strategy. Prerequisite: AM 271. (Summer) Divita
- 275 **Information Systems for Associations** (3)  
Introduction to the concepts of information systems as employed in associations. Data-base management systems, telecommunications systems, small business computers. (Fall) Staff
- 276 **Organization and Management of Associations** (3)  
Integrative approach to organizational and management concepts, theories, and practices, with particular attention to the problems of associations and similar types of organizations. Functions, roles, and responsibilities of the association manager. (Spring) Staff
- 277 **Financial Management for Associations** (3)  
An overview of basic accounting principles and practices as they apply to associations, with attention to the economics of association management and



financial planning, reporting, and auditing. Investments, revenues, bonds, debt, government funds. (Fall)

279 **Current Issues in Association Management** (3)

Keane

A review of elements of association management, with attention to the number and variety of associations and their responsibilities in present-day society. Particular attention is given to the problems associations face now and will face in the future. A capstone seminar providing a review and synthesis of the Association Management Program. (Fall and spring)

## ASTRONOMY

See Physics.

## BIOCHEMISTRY—GRADUATE PROGRAMS

Professors J.M. Bailey, A.L. Goldstein (Chair), L.L. Gallo, A. Kumar

Associate Professors T. Moody, J.Y. Vanderhoek, R.S. Schulof, G. Fiskum, V. Hu

**Master of Science in the field of biochemistry**—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22, 223, 227, 234, 250, 266, 299–300, and the Comprehensive Examination. It is expected that students will complete all of the required work in approximately two years.

**Doctor of Philosophy in the field of biochemistry**—Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22, 223, 227, 234, 250, 266, 398, 399, and the General Examination.

**Research fields:** endocrinology—thymosins, steroid hormones, prostaglandins; immunology—immunochemistry, gene transfer; lipids and membranes—essential fatty acids, complement, lipoproteins, complex lipids, cholesterol, peroxides, atherosclerosis, steroidogenesis; neurochemistry—endorphins, enkephalins, nerve growth factors, bombesin; bioenergetics—mitochondria,  $\text{Ca}^{2+}$  transport, tumor cell metabolism, ischemia.

221–22 **General Biochemistry** (4–4)

Gallo and Staff

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

223 **Physical Biochemistry** (3)

Vanderhoek

Lectures cover basic laboratory techniques used in contemporary biochemical and molecular biological research. (Fall)

227 **Biochemistry Seminar** (1)

Fiskum and Vanderhoek

Current literature in biochemistry. Limited to students in the Department of Biochemistry graduate program. May be repeated for credit. (Fall and spring)

230 **Current Topics in Enzymology** (2)

Bailey and Staff

Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2)

Fiskum

Content includes biochemical thermodynamics, oxidation–reduction processes, oxidative phosphorylation, photosynthesis, and chemiosmotic energy coupling. Prerequisite: Bioc 221–22 or 201. (Fall)

234 **Structure and Function of Proteins and Enzymes** (3)

Hu and Staff

Structure–function relationships of proteins, enzyme kinetics, regulation and reaction mechanisms, and other special topics. Prerequisite: Bioc 221. (Spring)

235 **Current Topics in Bioenergetics** (1 or 2)

Fiskum

Directed readings in various areas of bioenergetics. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 231.



- 240 **Nutrition** (2) Walker and Staff  
Content includes discussion of RDA, nitrogen balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221-22. (Spring)
- 250 **Molecular Biology** (3) Kumar and Staff  
Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. Prerequisite: Bioc 201 or 221-22. (Fall)
- 251 **Current Topics in Molecular Biology** (1 or 2) Kumar and Staff  
Directed readings in the area of molecular biology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 250.
- 252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Kumar and Staff  
Emphasis on the biochemical and molecular aspects of selected diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)
- 260 **Biochemistry of Lipids and Membranes** (2) Vanderhoek  
Biochemistry, structure, and function of various lipid classes, membranes, and receptors. Prerequisite: Bioc 221-22. (Spring)
- 261 **Current Topics in Lipids** (1 or 2) Staff  
Directed readings in the area of lipid biochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 260.
- 262 **Lipoproteins** (2) Gallo  
Composition, synthesis, and metabolism of lipoproteins in normal and dyslipoproteinemic subjects. Prerequisite: Bioc 221-22. (Spring)
- 266 **Cellular Biology** (3) Fiskum, Vanderhoek  
Structure and function of cellular membranes, cytoskeleton, subcellular organelles, cellular bioenergetics, and intercellular interactions. Prerequisite: Bioc 221-22. (Spring)
- 270 **Biochemistry and Cell Biology of the Immune Response** (2) Naylor\* and Staff  
Biochemical aspects of the immune response at the molecular and cellular level. Modern experimental approaches to immunology and cell biology. Prerequisite: Bioc 221-22 and Micr 229, or permission of instructor. (Spring)
- 271 **Current Topics in Immunology** (1 or 2) Goldstein and Staff  
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 270.
- 280 **Neurochemistry** (2) Moody and Staff  
Content includes molecular structure and function of nerve tissue; intra- and interneuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite: Bioc 201 or 221-22. (Fall)
- 281 **Current Topics in Neurochemistry** (1 or 2) Moody and Staff  
Directed readings in neurochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 280.
- 295 **Research in Biochemistry** (arr.) Staff  
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

\* Paul Henry Naylor is Associate Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.



## BIOLOGICAL SCIENCES

Professors S.O. Schiff, D.L. Atkins, R.K. Packer (Chair)  
 Adjunct Professors L.S. Kornicker, C.G. McWright  
 Professorial Lecturers H. Hoffman, R.P. Eckerlin  
 Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford, D.E. Johnson, J.R. Burns, R. Donaldson, K.M. Brown, D.L. Lipscomb  
 Associate Professorial Lecturers P.E. Spiegler, D. Goldman  
 Assistant Professors E.F. Wells, H.B. Wagner, D.W. Morris  
 Assistant Professorial Lecturer L.D. Killos

*Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—BiSc 11-12, or equivalent.

*Bachelor of Arts with a major in biology, botany, or zoology*—In addition to the general requirements listed above, the following must be taken:

1. Chem 11-12; Chem 151-52 and 153-54, or Chem 50. (The following courses are strongly recommended: Math 31; Phys 1, 2, 5, and 6; two years of French, German, or Russian; Stat 91 or 127.)

2. (a) Required courses for the major in biology—A minimum of 24 semester hours of second-group courses, which should include at least 6 hours in biology, 6 in botany, and 6 in zoology.

(b) Required courses for the major in botany—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included.

(c) Required courses for the major in zoology—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

*Bachelor of Science with a major in biology, botany, or zoology*—The following requirements must be fulfilled:

1. Required courses in related areas—Chem 11-12; Chem 151-52 and 153-54, or Chem 50; Phys 1, 2, 5, and 6; 3 semester hours of either mathematics or statistics (this requirement cannot be satisfied by waiver). Two years of French, German, or Russian are strongly recommended but not required.

2. (a) Required courses for the major in biology—A minimum of 30 semester hours of second-group courses, which should include at least 7 hours in biology, 7 in botany, and 7 in zoology.

(b) Required courses for the major in botany—A minimum of 30 semester hours of second-group courses; a minimum of 15 hours must be taken in botany, and no more than two zoology courses may be included.

(c) Required courses for the major in zoology—A minimum of 30 semester hours of second-group courses; a minimum of 15 hours must be taken in zoology, and no more than two botany courses may be included.

A maximum of 6 semester hours of independent study, undergraduate research, or graduate courses in biological sciences may be used to fulfill second-group course requirements for all majors.

*Special Honors*—In addition to the general requirements stated under Regulations, in order to be considered for graduation with special honors, a student must maintain a cumulative 3.5 quality-point index in biological science courses and at least a 3.0 cumulative overall quality-point index.

*Minor in biology*—12 semester hours of second-group courses (excluding BiSc 171 through 176), which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

*Minor in botany*—12 semester hours of second-group courses (excluding BiSc 171 through 176), of which 8 hours must be in botany.



Minor in zoology—12 semester hours of second-group courses (excluding BiSc 171 through 176), of which 8 hours must be in zoology.

*Master of Science in the field of biology, botany, or zoology*—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany, or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151-52 and 153-54, or 50; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

*Master of Arts in the field of museum studies, with specialization in the biological sciences*, see Museum Studies.

*Doctor of Philosophy in the field of biology, botany, or zoology*—Required: the general requirements stated under the Graduate School of Arts and Sciences, plus satisfactory completion of a Preliminary Examination and the General Examination in at least three areas of biology. The program of study and fields of study are determined in consultation with an advisory committee appointed for each candidate.

Major Research Areas: ecology, evolution and systematics, plant biology, genetics, cell and molecular biology, developmental biology, vertebrate and invertebrate anatomy and physiology, marine and freshwater biology.

*Master of Science and Doctor of Philosophy in the field of geobiology*, see Geobiology.

**Departmental prerequisite:** BiSc 11-12 or equivalent is prerequisite to all second-group courses in biology, botany, and zoology, except by permission of the instructor.

## BIOLOGY

### First Group

#### 3-4 **Introductory Biology for Nonscience Majors** (3-3)

Lecture (2 hours), laboratory (2 hours). BiSc 3: Principles of cell biology; structure and function of plants and animals; animal behavior. BiSc 4: Human anatomy and physiology; genetics; evolution; ecology. Prerequisite to BiSc 4: BiSc 3. Laboratory fee, \$30 per semester. (Academic year) Schiff

#### 11-12 **Introductory Biology for Science Majors** (4-4)

Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of cell and molecular biology, cell physiology, inheritance, and evolution. BiSc 12: Investigation of principles of organismic biology, including diversity, form and function of plants and animals, and ecology. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Laboratory fee, \$40 per semester. (Academic year) Hufford

### Second Group

#### 103 **Marine Biology** (4)

Lecture (2 hours), laboratory and field (4 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal ecosystems and man's influence on them. Laboratory fee, \$40. (Spring) Knowlton

#### 107 **Field Biology** (4)

Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer, odd years) Merchant



- 108 **Organic Evolution** (3) Lipscomb  
Synthetic theory of organic evolution, including population biology, speciation, adaptation, macroevolution, systematics, biogeography, and an overview of the course of evolution from prebiotic Earth to the emergence of man. (Fall)
- 111 **Introductory Microbiology** (4) Morris  
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Laboratory fee, \$40. (Fall)
- 113 **Protistology** (4) Hufford, Lipscomb  
Lecture (2 hours), laboratory (4 hours). Examination of the diversity, evolution, morphology, physiology, ecology, and reproduction of both photosynthetic and heterotrophic protists. Laboratory fee, \$40. (Spring, even years)
- 122 **Cell Biology** (3) Morris  
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)
- 123 **Cell Biochemistry** (3) Donaldson  
Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)
- 124 **Cell Biochemistry Laboratory** (2) Donaldson  
Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Laboratory fee, \$40. (Fall)
- 127 **Genetics** (3) Johnson  
Introduction to genetics, with emphasis on the integration of transmission of genetic traits and the chemical basis of gene action. Also includes cytogenetics, gene regulation, and examples of current applications of genetic technology. (Fall and spring)
- 128 **Genetics Laboratory** (1) Johnson  
Study of genetic principles using *Drosophila*, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Laboratory fee, \$40. (Fall and spring)
- 138 **Advanced Genetics** (3) Johnson  
Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)
- 140 **General Ecology** (4) Merchant  
Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer and their relationship to the structure and function of population, species, communities, and ecosystems. Laboratory fee, \$40. (Fall)
- 144 **Aquatic Ecology** (4) Merchant  
Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats, and communities. Laboratory fee, \$40. (Spring, odd years)
- 167 **Radiation Biology** (3) Schiff  
Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals. Recommended: cell biology and chemistry or physics. (Fall)
- 168 **Tropical Marine Biology** (4) Knowlton, Packer  
Study of relationships between organisms and physical, chemical, and biological factors in a tropical marine-estuarine environment, conducted through ecological fieldwork in characteristic tropical ecosystems on the island of San Salvador, Bahamas. Laboratory investigations on organism physiology. Recommended: BiSc 103 and/or 163. Laboratory fee, \$40. (Summer, even years)
- 169 **Applied Marine Ecology** (4) Knowlton  
Field study of interactions among biotic and abiotic components of temperate-boreal ecosystems, with emphasis on man's impact and utilization of coastal



resources, conducted through surveys of ecosystems along the Maine coast and associated laboratory work, supplemented by lectures and discussion. Application of ecological and oceanographic research techniques to polluted as well as relatively unspoiled sites. Recommended: BiSc 103 and/or 140. Laboratory fee, \$65. (Summer, odd years)

- 171 **Undergraduate Research** (arr.) Staff  
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in biological science courses. Laboratory fee, \$20 per semester hour. (Fall and spring)
- 172 **Independent Study in Cell and Molecular Biology** (2) Donaldson, Morris  
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)
- 173 **Independent Study in Developmental Biology** (2) Brown, Burns  
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and Spring)
- 174 **Independent Study in Organismic Biology** (2) Knowlton, Wagner, Wells  
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)
- 175 **Independent Study in Genetic and Evolutionary Biology** (2) Johnson, Lipscomb  
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)
- 176 **Independent Study in Environmental Biology** (2) Hufford, Merchant  
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)
- 185 **Human Nutrition** (3) Staff  
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Spring)

### Third Group

- 208 **Bioenergetics** (3 or 4) Merchant  
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Students enrolling for 4 credits will devote one additional class meeting per week to an investigation of the nature and methods of science. Prerequisite: BiSc 140 or permission of the instructor. (Fall, odd years)
- 209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Lipscomb  
Current problems and issues in evolution; speciation, macroevolution, biogeography, and topics of special interest to participants. Prerequisite: BiSc 108 or equivalent. (Fall)
- 210 **Methods of Study of Evolution** (4) Lipscomb  
Lecture (3 hours), laboratory and field (2 hours). Review of selected topics of current interest in the study of evolution, such as principles of phenetic and phylogenetic systematics, study of biogeography, and biochemical methods of examining evolution. Laboratory fee, \$40. Prerequisite: BiSc 108 or equivalent. (Fall, even years)
- 220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson  
Course content changes each session, alternating between selected topics in cell biochemistry and plant biochemistry. May be repeated for credit. Prerequisite: BiSc 122 or 123 or 135 or equivalent. (Spring)
- 222 **Current Topics in Cellular and Molecular Biology** (1) Staff  
Discussion of current publications in the areas of genetic engineering, organelle



biogenesis, membrane function, plant gene structure and function, and transposable elements. May be repeated for credit provided that the topic differs.

227 **Seminar: Genetics** (3) Johnson

Review of selected topics in genetics, with emphasis on current literature; topics of special interest to participants encouraged. May be repeated for credit. Prerequisite: BiSc 127 or equivalent. (Fall, odd years)

228 **Population Genetics** (3) Johnson

Origin, maintenance, and possible significance of genetic variation in populations. Selection, genetic drift, microevolution of species, and speciation are emphasized. Both theoretical and applied aspects of population genetics are discussed. Prerequisite: BiSc 127 or equivalent. (Fall, even years)

229 **Cytogenetics** (3) Staff

Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. Prerequisite: BiSc 122 or 123 and 127 or equivalent. (Fall)

230 **Human Genetics** (3) Staff

Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent; previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

243 **Seminar: Ecology** (3) Merchant

In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Brown

Survey of current research in selected topics in experimental morphology, biochemical development, and developmental endocrinology. Emphasis on the principles and problems of pattern formation in animals. Prerequisite: BiSc 145 or equivalent. (Fall, even years)

249 **Seminar: Developmental Biology** (3) Brown

Discussion and reports on recent research on the endocrinological, genetic, and biochemical aspects of animal development. Prerequisite: one course in developmental biology or cell biology. May be repeated for credit. (Spring)

272 **Scanning Electron Microscopy** (3) Atkins

Theory and practice of scanning and transmission electron microscopy, including specimen preparation, photography, and analysis of ultrastructural observations. Laboratory fee, \$65. (Spring)

274 **Gene Regulation and Genetic Engineering** (3) Morris

The control of gene expression as illustrated by several prokaryotic and eukaryotic model systems: discussions of recombinant DNA techniques. Prerequisite: BiSc 127. (Spring, odd years)

275 **Introduction to Recombinant DNA Techniques** (3) Morris

Lecture, 1 hour; laboratory, 4 hours. Basic techniques of genetic manipulation: isolation of phage and plasmid DNA, cloning of genes, transformation of bacteria, mutagenesis of cloned genes, and other techniques. Prerequisite: BiSc 111 or 122 or 127 or equivalent and permission of instructor. Laboratory fee, \$40. (Fall, even years)

295 **Research** (arr.) Staff

Investigation of special problems. May be repeated for credit. (Fall and spring)

299-300 **Thesis Research** (3-3) Staff

(Fall and spring)

**Fourth Group** (Applicable to Biology, Botany, and Zoology)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)



- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit.  
and spring)

## BOTANY

### Second Group

- 105 **Field Botany** (4)  
Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local flora. Because of conflicting field-trip schedules, concurrent registration in BiSc 141 is not allowed. Laboratory fee, \$40. (Fall; may be repeated for credit during the summer)
- 109 **Developmental Plant Anatomy** (4)  
Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Laboratory fee, \$40. (Spring, odd years)
- 110 **Plant Diversity** (4)  
Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study. Laboratory fee, \$20. (Spring, odd years)
- 125 **Flowering Plants** (4)  
Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Laboratory fee, \$40. (Spring)
- 126 **Flora of the Mid-Atlantic States** (4)  
Field trips and laboratory study of the identification and ecology of vascular plants of the Coastal Plain, Piedmont, and mountains of Delaware, Maryland, Virginia, and West Virginia. Emphasis on family characteristics and recognition of dominant species in native habitats. Weekend trips required. Laboratory fee, \$40. (Summer)
- 135 **Plant Physiology** (4)  
Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11-12. Recommended: Chem 50 or 151-52. Laboratory fee, \$40. (Spring)
- 141 **Plant Ecology** (4)  
Lecture (2 hours), laboratory (4 hours). Introduction to the dynamics of plant communities, populations, and individuals. Several Saturday and weekend field trips required. Because of conflicting field-trip schedules, concurrent registration in BiSc 105 is not allowed. Laboratory fee, \$40. (Fall)

### Third Group

- 221 **Variation and Evolution in Plants** (3)  
Biosystematics of plants, covering the literature, concepts, and methodology of chemotaxonomy, breeding systems, cytogenetics, population genetics, and other studies of speciation, evolution, and classification. Prerequisite: BiSc 105 or 108 or 125 or 127. (Spring, even years)
- 238 **Seminar: Current Topics in Phycology** (3)  
A review of current literature regarding selected aspects of algal systematics, morphology, physiology, or ecology. (Fall, even years)
- 239 **The Biology of Freshwater Diatoms** (4)  
The systematics, morphology, physiology, and ecology of freshwater diatoms. Field and laboratory studies emphasize familiarity with local taxa. Laboratory fee, \$40. (Fall, odd years)
- 242 **Advanced Plant Ecology** (3)  
Review of selected topics in adaptive plant strategies and physiological ecology. Prerequisite: BiSc 107 or 140 or 141. (Spring, odd years)
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)



## ZOOLOGY

## Second Group

- 101 **Invertebrate Zoology** (4) Knowlton  
Lecture (3 hours), laboratory (3 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Laboratory fee, \$40. (Fall)
- 104 **Comparative Vertebrate Anatomy** (4) Atkins  
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Laboratory fee, \$40. (Fall)
- 120 **Animal Behavior** (3) Wagner  
An evolutionary approach to the study of animal behavior, emphasizing behavioral ecology and sociobiology. (Spring)
- 143 **Animal Ecology** (4) Merchant  
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, \$40. (Spring, even years)
- 145 **Principles of Development** (4) Brown  
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Laboratory fee, \$40. (Fall)
- 146 **Experimental Developmental Biology** (4) Brown  
Lecture (2 hours), laboratory (4 hours). Molecular and cellular biology of development through examination of the literature and complementary laboratory experiments. Laboratory exercises involve micromanipulative and biochemical operations on embryos fertilized in the lab. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology. Laboratory fee, \$40. (Spring)
- 148 **Histology** (4) Burns  
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Laboratory fee, \$40. (Spring)
- 153 **Survey of Neurobiology** (4) Atkins  
Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Laboratory fee, \$40. (Fall)
- 155 **Parasitology** (4) Eckerlin  
Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Laboratory fee, \$40. (Fall)
- 157 **Comparative Endocrinology** (4) Burns  
Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuroendocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151-52 or 50. Laboratory fee, \$40. (Fall)
- 163 **Human Physiology** (3) Packer  
Introduction to the function of organ systems of the human body. Prerequisite: Chem 11-12. (Fall)
- 164 **Human Physiology Laboratory** (1) Staff  
Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Laboratory fee, \$40. (Fall)
- 165 **Advanced Human Physiology** (4) Packer  
Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151-52 or 50. Laboratory fee, \$40. (Spring)



**166 Ornithology (4)**

An introduction to the study of birds from an ecological perspective. Includes visits to the collections and exhibits of the Smithsonian Institution's Museum of Natural History and National Zoological Park, several short field trips, two full-day Saturday trips for waterfowl and migrants, and one evening field trip for owls. Laboratory fee, \$30. (Spring, even years) Wagner

**Third Group****204 Seminar: Invertebrate Zoology (3)**

Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 101 or equivalent. (Fall) Knowlton

**211 Symbiosis and Evolution (3)**

Study of the adaptations and evolution of parasites, including coevolution of parasites and hosts, competition for hosts, evolution of life cycles, and topics of special interest to participants. (Spring, odd years) Lipscomb

**212 Seminar in Comparative Reproductive Biology (3)**

Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. Prerequisite: BiSc 165 or equivalent. (Spring) Burns

**252 Seminar: Neurobiology (3)**

Study of current publications in comparative neurobiology. May be repeated for credit with instructor's permission. (Spring, even years) Atkins

**265 Epithelial Transport (3)**

A survey of cellular mechanisms of electrolyte, water, and metabolite transport, with emphasis on osmotic and acid-base balance. (Fall) Packer

**299-300 Thesis Research (3-3)**

(Fall and spring) Staff

**BUSINESS ADMINISTRATION**

Professors F. Amling, P.D. Grub, N.M. Loeser, G.P. Lauter, A.I. El-Ansary, B. Burdetsky, S.F. Divita, R. Eldridge, R.F. Dyer, S.N. Sherman, F. Ghadar, Y.S. Park, H.G. Askari, H.J. Davis, T.M. Barnhill (Chair), A.E. Hammad (Visiting), W.E. Seale (Distinguished Visiting), L.E. Lippert, Jr. (Visiting)

Professorial Lecturers S.A. Seelig, D.A. Peterson, D.L. Edgell, N. Bruck, J.H. Joseph, T.J. Curry

Associate Professors R.L. Holland, J.M. Sachlis, P.B. Malone III, D.J. Lenn, M.L. Liebrecht, Himes, L.M. Maddox, J.B. Thurman, J.H. Perry, N.G. Cohen, F. Robles, M.S. Katzman, J. Cook (Visiting), D. Smith Cook, P.S. Peyser

Associate Professorial Lecturers D.M. Devaney, R. Strand

Assistant Professors D.R. Kane, C.C. Shepherd, Jr., E.J. Englander, T.E. McCue, D.B. Smith, S.B. Jenkins, J.H. Beales III, M.S. Klock, J.H. Lin (Visiting), S.G. Goldberg (Visiting), G.M. Jabbour (Visiting)

Assistant Professorial Lecturers W.N. LaForge, G.I. Friend, L.P. Katsanis, B.L. Sudweeks

See the School of Government and Business Administration for programs of study in business administration leading to the degrees of Bachelor of Business Administration, Master of Business Administration, and Doctor of Philosophy.

**First Group****51 Introduction to Business (3)**

Structure, activities, and problems of business enterprise; its contribution to the individual and society; careers in business. (Fall and spring) Davis, Katzman, Thurman, Smith Cook



## Second Group

- 101 **The Business Environment** (3) Lenn, Englander, Beales  
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues. Restricted to seniors in the B.B.A. program. (Fall and spring)
- 104 **Business and the Legal System** (3) Shepherd, LaForge  
General overview of the legal system, role of law, and key legal concepts such as torts and contracts. Specific business applications—antitrust, employer obligations, organization of business enterprise, securities regulation, international law. (Fall and spring)
- 110 **Human Resources Management** (3) Burdetsky, Katzman, Malone  
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)
- 115 **Leadership in Human Resources** (3) Burdetsky  
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 110. (Fall)
- 117 **Collective Bargaining** (3) Burdetsky  
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 110. (Spring)
- 120 **Business Finance** (3) Jenkins, Jabbour  
Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, and cost of capital. Prerequisite: Accy 51-52; Econ 1; Math 51-52; Stat 51. (Fall and spring)
- 123 **Investment and Portfolio Management** (3) Amling, Cohen  
Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: BAd 120. (Fall and spring)
- 124 **Advanced Financial Management** (3) Barnhill  
Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financing, dividend policy, and other special topics in finance. Prerequisite: BAd 120. (Fall and spring)
- 130 **Working Capital Management** (3) Klock  
The analysis of corporate short-term sources and uses of funds. Optimization techniques and case studies emphasized. Bank lending practices are evaluated within the working capital area. Prerequisite: BAd 120. (Spring)
- 132 **Real Estate Investment** (3) Seale  
Principles of real estate investment, including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 120. (Fall and spring)
- 133 **Fundamentals of Insurance and Risk Management** (3) Staff  
Functions of insurance and risk management in business enterprise. (Spring)
- 135 **Capital Formation** (3) Jenkins  
The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 120. (Fall and spring)
- 140 **Basic Marketing Management** (3) El-Ansary, Maddox, Hassan  
Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing, and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1-2, Stat 51. (Fall and spring)



- 142 Consumer Behavior (3)** Dyer, Maddox, Hassan  
An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, adoption of innovations, and store choice decisions. Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 140. (Fall and spring)
- 143 Marketing Research (3)** Dyer, Hassan  
Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: questionnaire construction and data analysis with statistical software packages. Prerequisite: BAd 140, Stat 51, Mgt 58. (Fall and spring)
- 148 Advertising (3)** Maddox, Dyer  
Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion. Prerequisite: BAd 140, 142. (Fall and spring)
- 149 Advanced Advertising Campaigns (3)** Maddox  
An application of the principles of marketing and advertising to a real-world situation in the development of an advertising campaign. Students work in an advertising agency atmosphere to perform such tasks as situation analysis, market segmentation, marketing research, media selection, and copywriting in the preparation of the advertising campaign. The culmination is the presentation of the campaign at a national competition sponsored by the American Advertising Federation. Five students from the class will be selected as presenters. Prerequisite: BAd 140, 142, 143, 148, or permission of instructor. (Spring)
- 150 Salesmanship and Sales Management (3)** Divita  
Development of personal selling and presentation skills; examination of types of selling situations. Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 140. (Fall and spring)
- 152 Retailing Management (3)** El-Ansary  
A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 140. (Fall)
- 159 Marketing: Strategic Planning (3)** El-Ansary, Dyer, Liebrez  
A capstone seminar for marketing majors. Analytical integration of material covered in previous marketing courses. Marketing strategy literature, financial dimensions of marketing management, and comprehensive cases. Prerequisite: BAd 140, 142, 143, 150, and one additional marketing major field course. (Fall and spring)
- 160 Introduction to International Business (3)** Robles, Grub  
Social, cultural, political, legal, and technological environment of multinational business, emphasizing host-government/multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)
- 166 International Marketing Management (3)** Lauter, Robles  
Scope of international markets; factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 140. (Fall and spring)
- 168 Foreign Market Analysis (3)** Grub  
Patterns of world trade by country, commodities, and products; selected regional analyses, in-depth market studies. Prerequisite: BAd 160, 166. (Fall and spring)



- 171 **International Business Finance** (3) Eldridge, Askari  
Analysis of the international economic environment and its influence on corporate financial management of international operations. Prerequisite: BAD 120. (Fall and spring)
- 173 **International Banking** (3) Ghadar, Park  
Theory and practice of international banking; analysis of international commercial and investment banking from a management perspective; subjects include current international monetary and financial environment, money in capital markets, and topical problems of international banking from a management perspective. Prerequisite: BAD 171. (Fall and spring)
- 175 **International Monetary and Financial Issues** (3) Eldridge  
International macro- and micro-issues of money, banking, and finance. Interrelationship, from a management perspective, of basic forces shaping international and financial policy. Topics include international monetary systems, Eurocurrency markets, LDC debt crises, role of the International Monetary Fund and World Bank, and development banking issues. For advanced undergraduate students with a background in international business finance. Prerequisite: BAD 171 or permission of instructor. (Fall and spring)
- 180 **Materials and Purchasing Management** (3) Perry, Sherman  
Product and nonproduct purchases and materials cycle management. Requirements planning and make-or-buy decisions. Source identification, qualification, and selection. Pricing, inventory, control systems, buying practices, purchase records. Policy and procedure development, ethical questions. Case analyses. (Fall and spring)
- 181 **Management of Public Acquisitions** (3) Perry, Sherman  
Requirements planning, regulatory and policy environment, programming and budgeting factors, solicitation and award methods pertinent to public procurement, strategies, international purchasing, public grants, audit, and ethical considerations. (Fall)
- 182 **Physical Distribution Management** (3) Perry, Sherman  
Physical distribution and warehousing systems of the United States. Economic role, modes of transport, international perspectives, private and public finance, policy issues. Traffic management, carrier management. Regulatory change, energy, environmental and safety concerns. (Spring)
- 183 **Logistics Management** (3) Perry  
Physical distribution and customer service management. Storage, inventory, financial and information implications. International distribution. Strategy formulation for the logistics system. Case analyses. (Fall)
- 184 **Contract Management** (3) Sherman  
The unique relationships created when independent organizations are joined by contract over long periods. Terms and conditions, specifications, information flow, progress monitoring. Direction and control problems, property issues, financial relationships, changes, schedule adherence, negotiation, termination, and audit problems. (Spring)
- 188 **Managing Production/Operations** (3) Holland, Perry  
Basic principles and methods of manufacturing production. Manufacturing facilities, plant, and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAD 110, 191. Restricted to seniors in the B.B.A. program. (Fall and spring)
- 190 **Special Topics in Business Administration** (3) Staff  
Experimental offering; new course topics and teaching methods.
- 191 **Fundamentals of Management** (3) Davis, Malone, Thurman, Katzman, Smith Cook  
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)
- 192 **Small-Business Management** (3) Holland  
Theory and practice of small-business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and compari-



son of purchase of an ongoing firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 191. (Fall)

197 **Strategy Formulation and Implementation (3)**

Thurman, Smith Cook, Davis

An integrative capstone course, covering the concept of strategy, tasks and processes of strategy and policy formulation and implementation, and ramifications of aligning the functional and behavioral processes of the organization to facilitate accomplishment of the organization's mission and objectives. The course develops the student's skills in conducting situation audits, diagnosing organizational problems, formulating and selecting strategic alternatives, and recognizing problems inherent in strategy implementation. Methodology includes case analyses, decision simulations, and lectures. Restricted to seniors in the B.B.A. program. Prerequisite: BAd 110, 120, 140, 191, and 188. May be taken concurrently with BAd 188. (Fall and spring)

199 **Individual Research (arr.)**

Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

**Third Group**

201 **Social and Legal Environment of Business (3)**

Kane, Shepherd, Englander

This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management; business responsibility, ethics. The American legal system, federal regulation, constitutional and administrative law. Business and public policy. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business-Government Relations (3)**

Lenn, Englander

Economic, political, and philosophical foundations of the business-government relationship in theory and practice. Antitrust, public utility, and other regulation, consumer and environmental protection, conditions of employment; effective business response—present status and future prospects. Prerequisite: BAd 201 or equivalent. (Fall and spring)

203 **Federal Government Regulation of Society (3)**

Tolchin

Same as PAd 216.

204 **Regulation of Business: Administrative Law (3)**

Kane

Principles of federal regulation of business through administrative bodies. Analysis of sources and limits of the powers and prerogatives of administrative bodies in adjudicative, executive, and rule-making functions. Theoretical and practical aspects of regulations; other topics. Prerequisite: BAd 201, 202 or equivalent. (Fall)

205 **Business Representation and Lobbying (3)**

Joseph

Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations. (Fall)

206 **Applied Microeconomics (3)**

Beales

Applications of economic theory to public and private decisions affected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 270 or equivalents. (Spring)

208 **Macroeconomic Policy and Business (3)**

Beales

Interpretation of economic conditions in the short and long run; theory and practice of monetary and fiscal policy; applications of business conditions analysis to business planning, management, and policy. Prerequisite: Econ 218 and Mgt 270 or equivalents. (Fall)

209 **Seminar: Business Economics and Public Policy (3)**

Lenn

Analysis and discussion of selected issues by students and representatives of government and business. Prerequisite: BAd 201, 202, or equivalent. (Spring)



- 210 **Human Resources Management** (3) Loeser, Malone  
Survey of personnel management practices and procedures, including labor-management relations. Same as PAd 231. (Fall and spring)
- 211 **Seminar: Human Resources Management** (3) Burdetsky, Katzman  
Industrial personnel and manpower management, research in advanced problems. (Spring)
- 212 **The Human Resources Manager** (3) Malone  
The personnel manager and his or her place in the organization, relation to other executives, policy role, and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 210 or permission of instructor. Same as PAd 232. (Summer)
- 215 **Leadership and Executive Development** (3) Loeser  
Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels: executive selection and development. Prerequisite: Mgt 205 or permission of instructor. (Fall and spring)
- 217 **Unionism and Collective Bargaining** (3) Burdetsky  
The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)
- 218 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky  
Current problems and issues. (Spring)
- 220 **Business Financial Management** (3) McCue, Jabbour  
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisite: Accy 201, Econ 217, Mgt 218 and 270, or equivalents. (Fall and spring)
- 221 **Financial Decision Making** (3) Sachlis, Peyser  
Theory and practice of business finance, emphasizing the impacts of long- and short-term uses and sources of funds on the firm's value. Prerequisite: BAd 120 or 220. (Fall and spring)
- 222 **Seminar: Capital Formation** (3) Jenkins, Sachlis  
Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 120 or 220. (Fall and spring)
- 223 **Investment Analysis and Portfolio Management** (3) Amling, Cohen  
Risk-reward analysis of security investments, including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 120 or 220. (Fall and spring)
- 224 **Financial Management** (3) Cohen, Barnhill, McCue  
Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 221. (Fall and spring)
- 225 **Economic, Social, and Legal Aspects of Urban Development** (3) Fuller  
Same as U&RP 259. Examination of the forces that shape urban development; introduction to market analysis methods and techniques to evaluate project feasibility; study of the institutional and legal framework within which urban development occurs and that influences controls, land value, and development potential; and analysis of roles and responsibilities of the public and private sector in the urban development process. Prerequisite: Completion of Common Body of Knowledge courses. (Fall)
- 226 **Financing Urban Development** (3) McCue  
Principles of development finance: evaluating and measuring the investment attractiveness of real estate projects; obtaining, differentiating, and hedging sources of real estate funding; and appraising property. Although emphasis is on



- the private sector, the importance of financial conditions of and incentives provided by local, state, and federal governments is considered. Prerequisite: BAd 225 or permission of instructor. (Fall and spring)
- 227 **Problems in Urban Development** (3) Applications of market analysis, valuation, and financial techniques to the development process. Prerequisite: BAd 225/U&RP 259 and BAd 226; must be taken concurrently with BAd 228/U&RP 264. (Spring) McCue
- 228 **Urban Development Planning and Design** (3) Same as U&RP 264. Application of planning/design principles and techniques in a studio/laboratory environment. Field reconnaissance and graphic techniques applied to projects in site selection, site analysis, concept formulation, and site planning in an urban context. Public and private sector issues are addressed in the preparation of a project development proposal. Prerequisite: BAd 225/U&RP 259 and BAd 226; must be taken concurrently with BAd 227. (Spring) Greene
- 231 **Seminar: Investment and Portfolio Management** (3) Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 223. (Fall) Amling
- 232 **Real Estate Finance** (3) Investment in and financing of real estate from the points of view of the developer, investor, borrower, and lender. Emphasizes vocabulary and identification of significant issues. Develops key analytical tools. Prerequisite: BAd 220. (Spring) McCue, Seelig
- 235 **Futures Markets: Trading and Hedging** (3) Organization and regulation of futures markets. Computer assistance of large data bases. Alternative strategies for profitable speculative trading of futures contracts for possible hedging uses. High risk-high return investment alternatives. The use of futures markets to manage risks caused by fluctuating interest rates, exchange rates, or commodity prices. Prerequisite: Introductory courses in economics, statistics, computer usage, and financial management. (Fall and spring) Barnhill, Seale
- 239 **Financial Theory** (3) In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy, and the capital asset pricing framework. Prerequisite: BAd 221, 223. Offered every third semester. Peyser, Sachlis
- 240 **Marketing Management** (3) This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision making; developing an integrated marketing plan. Prerequisite: Econ 217-18. (Fall and spring) Dyer, Divita, El-Ansary, Liebrecht
- 241 **Advanced Marketing Management** (3) For M.B.A. students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (Fall and spring) Divita, Liebrecht
- 242 **Buyer Behavior** (3) Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 240 or permission of instructor. (Fall) Dyer, Hassan
- 243 **Marketing Research** (3) The marketing research process: designing, conducting, and using market research studies. Survey and experimental designs. Data analysis with statistical software packages. Prerequisite: BAd 240, Mgt 218 and 270, or equivalent. (Fall) Dyer, Hassan
- 246 **Marketing of Services** (3) Management of the activities involved in marketing new and existing services. The innovation system (behavioral and organizational) of service product development. (Fall) Liebrecht



- sions, product planning processes, marketing auditing, services and the law, and new service trends. Marketing of intangibles and services is highlighted. Prerequisite: BAd 240. (Spring)
- 248 **Advertising and Sales Promotion** (3) Dyer, Maddox  
Examination of advertising and sales promotion from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 240. (Spring)
- 250 **Selling and Sales Management** (3) Divita  
The sales function from the viewpoints of the sales person and the sales manager. The first part of the course will focus on the selling task, with attention to ethical and legal issues, the selling process, human behavior and selling, account management and internal selling, negotiation and non-selling aspects of sales work. The second part of the course will focus on the managerial issues associated with sales management, with attention to demand analysis and resource allocation, financial planning, quota setting and control, motivation, coaching and incentives, sales administration, and analysis of sales performance. Prerequisite: BAd 240. (Fall and Spring)
- 253 **Marketing Channels** (3) El-Ansary, Perry  
Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall)
- 257 **Marketing and Public Policy** (3) Divita, Gillis  
Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government, business, and advocate viewpoints presented. Prerequisite: BAd 240 or permission of instructor. (Fall)
- 259 **Marketing Strategy** (3) Divita, El-Ansary  
Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: completion of at least three Second-Level marketing courses or permission of instructor. (Spring)
- 261 **Multinational Corporations in the World Economy** (3) Ghadar, Grub  
Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)
- 262 **Seminar: International Trade** (3) Eldridge, Edgell  
Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring)
- 263 **Legal Aspects of International and Multinational Business** (3) Peterson  
Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation; topics of current interest. (Fall and spring)
- 266 **International Marketing** (3) Lauter, Robles  
Organizational structures. Analysis of international markets. Market-entry strategies and product policies. Special issues. Channels of distribution, promotional and price policies. Prerequisite: BAd 240. (Fall and spring)
- 267 **Regional International Marketing Systems** (3) Lauter  
Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Eastern Europe, and China, as they



affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies. (Fall and spring)

- 271 **International Business Finance** (3) Ghadar, Park, Askari  
Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 120 or 220. (Fall and spring)
- 273 **Seminar: International Banking** (3) Park, Ghadar  
International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions, and the effect of international banks on national monetary policies. Prerequisite: BAd 271. (Fall and spring)
- 275 **External Development Financing** (3) Ghadar, Park  
Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning as affected by energy policies, inflation, recession, changes in the international monetary system, and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 271 or permission of instructor. (Fall and spring)
- 276 **Seminar: International Financial Markets** (3) Park, Askari, Ghadar  
Theory and practice of international financial markets. Operation and structure of the Eurocurrency market, such as interbank operations, Eurodollar CDs, and floating-rate Eurocredits. Control of the Eurocurrency market and the role of other financial centers. Study of Eurobond and floating-rate note markets as well as major foreign bond markets. Prerequisite: BAd 271 or 273. (Fall and spring)
- 277 **International Portfolio Selection and Management** (3) Sudweeks  
Theoretical knowledge and practical skills necessary for the efficient management of international financial asset portfolios. Numeraire currency, exchange rates, international taxation, international portfolio optimization, international financial assets and markets, performance measures and applications. Emphasis on computer-based analysis. Prerequisite: Econ 217-18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 223, 240. (Spring)
- 278 **International Business Negotiations** (3) Ghadar  
This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; development of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 261. (Fall and spring)
- 280 **Purchasing and Materials Management** (3) Page, Perry, Sherman  
Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. Same as PAd 280. (Fall and spring)
- 281 **Procurement and Contracting** (3) Lippert, Perry, Sherman  
Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. Same as PAd 281. (Fall and spring)
- 282 **Government Contract Administration** (3) Sherman  
Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Same as PAd 282. (Spring)
- 283 **Pricing and Negotiation** (3) Sherman  
Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost



- principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Same as PAd 283. (Fall)
- 285 **Systems Procurement and Project Management** (3) Lippert, Perry, Sherman  
Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Analysis of cases in public- and private-sector contractual or assistance activities. Same as PAd 285. (Fall and spring)
- 286 **Physical Distribution Management** (3) Perry, Sherman  
Transportation and communications services management, including optimization of cost and service in terms of full coordination of demand and supply patterns. Alternatives available to the physical distribution manager, given the economic characteristics, competitive conditions, and regulatory environment of the several transportation modes. Model location theory and distribution network planning and design. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217-18; BAd 201, 220, 240. (Spring)
- 287 **Manufacturing Control Systems** (3) Perry  
Inventory and production control concepts, techniques, and strategies for effective integration with basic finance, marketing, and manufacturing objectives. Forecasting methods, material requirements planning systems, distribution requirements planning techniques, and classical reorder-point inventory models. Mechanized inventory-production control systems are examined to highlight design issues in systems development and execution. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217-18; BAd 201, 220, 240. (Spring)
- 288 **Logistics Management** (3) Perry  
Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Accy 201; Mgt 218, 270; Econ 217-18; BAd 201, 220, 240. (Fall)
- 289 **Strategy Development in Manufacturing and Operations** (3) Holland, Perry  
Basic production methods and techniques that influence formulation of a firm's strategic policy for today's competitive environment. Traditional as well as new and improved systems for controlling capacity and output. Productivity analysis, cost control, materials planning, and other topics are examined in the development of a production strategy to ensure that the production function contributes to the overall profit of a firm in an optimal manner. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217-18; BAd 201, 220, 240. (Spring)
- 290 **Special Topics in Business Administration** (3) Staff  
Experimental offering; new course topics and teaching methods. May be repeated once for credit.
- 291 **Ethics and Business** (3) Griffith and Lenn  
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. Same as Phil 235. (Spring)
- 292 **New Venture Initiation** (3) Holland  
Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analysis of business functions needed to get started. Ongoing firms, franchising options, and new business start-ups. Prerequisite: Mgt 218, 270; Econ 217-18; BAd 201, 220, 240; Accy 201. (Fall and spring)
- 293 **American Business History** (3) Becker  
The history of American business institutions in manufacturing, distribution, transportation, and finance. Particular attention will be given to the period since industrialization, with consideration of business institutions in their economic, legal, governmental, and social contexts. Same as Hist 220. (Fall)



**294 Modeling and Analysis for Business Decisions (3)**

Modern business modeling and analysis methods used to solve business problems, with advanced applications from many fields of business. Emphasis on the integrated use of business methods, quantitative methods, and computers to reduce the risk associated with the management of a modern business entity. Prerequisite: Econ 217-18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 240; or equivalent with permission of instructor. Same as Mgt 274. (Fall)

**295 Research Methods (3)**

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. Use of computer library programs and preparation of a formal business report. (Fall)

**297 Strategy Formulation and Implementation (3)**

A required course for all M.B.A. students; it must be taken during the last semester of the program and may not be waived. The course provides an integrative approach to strategic management, stressing the general manager's perspective. It covers strategy formulation, implementation of strategy and policy, and evaluation and control of strategy in various types of organizations. Skills in strategic thinking and problem solving are emphasized, including scanning external environments, mobilizing and allocating organizational resources, selecting appropriate strategic alternatives, modifying organizational structures, and influencing organizational behavioral processes to facilitate achievement of the organization's purpose, goals, and objectives. Methodology includes case analyses, lectures, and decision simulations. Student ability to articulate strategic concepts is emphasized. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level M.B.A. courses. (Fall and spring)

**298 Directed Readings and Research in Business Administration (3)**

Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

**299 Thesis Seminar (3)**

Examination of thesis standards, research philosophy, and methodology. (Fall and spring)

**300 Thesis Research (3)**

(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

**311 Seminar: Public-Private Sector Institutions and Relationships (3)**

An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status. (Fall and spring)

**321 Seminar: Financial Markets (3)**

Research seminar in corporate financial theory, investment portfolio theory, and capital market theory. May be repeated once for credit. Prerequisite: BAd 222, 231, 239. Offered every third semester.

**341 Seminar: Marketing (3)**

Examination of major theoretical developments in marketing. Topics include advances in marketing theory, services marketing, and marketing for nonprofit organizations. Emphasis on emerging concepts in consumer behavior, channels, marketing communication, and marketing information systems. Offered every third semester.

**361 Colloquium on International Business (3)**

Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)



- 381 **Seminar: Materials and Operations Management** (3) Perry, Sherman  
Recent developments in manufacturing production and materials management; impact of technological economic and social change; significant related trends. Private- and public-sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 280, 281, or permission of instructor.
- 391 **Seminar: Business Management** (3) Burdetsky  
Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Emphasis on policy and strategic issues affecting the total enterprise. (Offered as the demand warrants)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to doctoral candidates preparing for the general examination. May be repeated for credit.
- 399 **Dissertation Research** (arr.) Staff  
Limited to doctoral candidates. May be repeated for credit.

## CHEMICAL TOXICOLOGY

See Forensic Sciences and Chemistry.

## CHEMISTRY

Professors T.P. Perros, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu, E.A. Caress, D.A. Rowley, D. Ramaker (Chair), M. King  
Associate Professors A. Montaser, K.C. Adiga (Research), H. Sambe (Research), J.H. Miller  
Associate Professorial Lecturer S.M. Barkin  
Assistant Professors D. DiLella, D.L. Sedney (Visiting)  
Lecturers A. Herner, J. Dinnin, J. Hilderbrandt

**Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental)**—The department offers two undergraduate majors, both designed to give students a broad background in the basic divisions of chemistry: analytical, inorganic, organic, and physical. Major I, while providing considerable concentration in chemistry, permits a wider selection of electives. It thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. Major II is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified by the American Chemical Society as having met the minimum requirements for professional training. One foreign language (Russian, Japanese, German, or French) is recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses for the Bachelor of Arts degree for Major I and Major II—Chem 11-12 and 22 and 23, or 15-16; required courses in related fields—Math 31, Phys 21-22. Bachelor of Science degree candidates must also take BiSc 11-12 or a year of other approved course work in the natural sciences or mathematics.
3. (a) Required courses for Major I—Chem 111-12, 113, 122, 134 or 235, 141, 151-52, and 153-54.

(b) Required courses for Major II—Chem 111-12, 113, 122, 123, 141-42, 151-52, 153-54, 235; one approved advanced course in chemistry or a related field. Required courses in related fields for Major II—Math 32 and a course in a structured computer programming language, such as Stat 129 or CSci 51.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry, as evaluated by the faculty.

An entering student who is considering chemistry as a major is strongly encouraged to consult the Chemistry Department advisor regarding the program of study for the first two years. In general, the following sequence of courses is recommended for those students considering Major II: first year—Chem 11-12, Math 31 and 32 (or 30 and 31 if necessary),



English composition, electives; second year—Chem 22 and 23, 151–52, and 153–54, Phys 21–22, Math 32 if not taken in first year, electives; third year—Chem 111–12, 113, and 141, computer programming, electives; fourth year—Chem 122, 123, 235, 142, one advanced course in chemistry or a related field, electives. Major I students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic programs.

*Bachelor of Science/Master of Science in the field of chemical toxicology*—This is a five-year program leading to the B.S. in the field of chemistry and M.S. in the field of chemical toxicology. The first three years of the program consist of undergraduate course work. Application for admission to the M.S. program in chemical toxicology will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance into the M.S. program in chemical toxicology is not desired or not obtained, the requirements for the B.S./B.A. in chemistry, either Major I or II, may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.S. program in chemical toxicology is obtained, the B.S. in chemistry will be awarded after the successful completion of the fourth year of the program.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences.
2. Course Requirements: Chem 11–12, 22 and 23, 111–12, 113, 122, 123, 141–42, 151–52, 153–54, 235; Phys 21–22; BiSc 11–12; Math 31, 32; Stat 127 and a course in a structured computer programming language; Phar 203; Bioc 221–22; Phyl 191; ForS 240, 245, and 242 or 270; either ForS or Chem 299–300; and two courses chosen from ForS 246, 248, 249, 269.

*Minor in Chemistry*—Required: Chem 11–12, 22 and 23, 50, and 110 or 111; Chem 151–52 and 153–54 may be substituted for Chem 50.

*Master of Science in the field of chemistry*—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work must include Chem 213 and 221 and at least two of the following: Chem 207, 236, and 251. Proficiency in computer programming must be demonstrated. Candidates are required to pass a Master's Comprehensive Examination.

*Thesis option*—30 semester hours of approved courses are required, including Chem 299–300, Thesis Research, which may be in analytical, inorganic, organic, or physical chemistry.

*Nonthesis option*—36 semester hours of approved courses are required, including Chem 298. Up to 9 semester hours in other departments relevant to the student's area of interest may be included in the program, subject to the approval of the Department of Chemistry. Students who are or will be employed in organizations dealing with science, technology, and public policy programs may wish to select from the following courses: PSc 203, 217, 222, 223, 252; PAd 260, 261; Mgt 233, 234.

*Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)*—Prerequisite: a bachelor's degree with a major in chemistry or geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12, 213 or other upper-level chemistry course approved by the advisor, and 299–300, and Geol 141, 241 or 243, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. Stat 129 or an equivalent course approved by the Department of Chemistry or Geology must be passed.

*Doctor of Philosophy in the field of chemistry*—Required: the general requirements stated under the Graduate School of Arts and Sciences. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses and



requirements as determined by consultation with the departmental program committee. Proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

**Research fields:** analytical and molecular spectroscopy, chemical instrumentation, combustion chemistry, chemical toxicology, fluorine chemistry, forensic chemistry, geochemistry, organic synthesis/natural products, photochemistry, structure/reactivity studies, surface science, theoretical chemistry, trace analysis, transition metal complexes.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry Department and the Science, Technology, and Public Policy program. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSc 203, 217, 222, 223, 252; PAD 260, 261; Mgt 233, 234.

**Doctor of Philosophy in the field of geochemistry** (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including Stat 129 and either Stat 118 and 119, or 91, and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

**Graduate Placement Examinations:** All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the Department of Chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

All graduate students are required to participate in the seminar and colloquium programs.

**Registration:** Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation, and laboratory sections. Upon consultation with course instructors, specific prerequisites may be waived for the particular courses.

## PHYSICAL SCIENCE

### First Group

- 3-4 **Contemporary Science for Nonscience Majors** (3-3) Filipescu  
Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4. Laboratory fee, \$20 per semester. (Academic year)

## CHEMISTRY

### First Group

- 11-12 **General Chemistry** (4-4) Perros, Rowley, White  
Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure and properties; stoichiometry; gas, liquid, and solid state; chemical bonding; solutions; chemical kinetics and equilibria; thermodynamics; acids and bases; electrochemistry; introduction to descriptive chemistry. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, \$35 per semester. (Chem 11 and 12—fall and spring)



- 13 General Chemistry (4)** Staff  
 For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14. Laboratory fee, \$35. After completion of Chem 13, Chem 11-12 may not be taken for credit. (Fall and spring)
- 15-16 Intensive General and Analytical Chemistry (4-4)** Staff  
 (Honors Course)  
 Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11-12 and 22, 23, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, \$35 per semester. (Academic year)
- 22 Introductory Quantitative Analysis (3)** Schmidt  
 Theory and practice of quantitative analysis by modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Correlated with Chem 23. Prerequisite: Chem 12, 13, or 16. (Fall and spring)
- 23 Introductory Quantitative Analysis Laboratory (2)** Schmidt and Staff  
 Laboratory complement to Chem 22. Prerequisite or concurrent registration: Chem 22. Laboratory fee, \$35. (Fall and spring)
- 50 Introduction to Organic Chemistry (4)** Caress, King  
 Lecture (3 hours), laboratory (3 hours). A one-semester course for students in other disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Credit may not be earned for both Chem 50 and Chem 151-52. Prerequisite: Chem 12 or 16. Laboratory fee, \$35. (Spring)

### Second Group

- 105 Environmental Chemistry (3)** Miller  
 Chemistry and physics of the environment, with emphasis on water and air pollution. Environmental analysis and modeling and their limitations. (Fall)
- 110 Introduction to Physical Chemistry (3)** Ramaker  
 Gas, solid, and liquid state, chemical thermodynamics, solutions, chemical equilibrium, kinetics, quantum chemistry, spectroscopy, and macromolecules. Prerequisite: Chem 16 or 22 and 23; Math 31; Phys 2 or 22; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111-12 or an equivalent course.
- 111-12 Physical Chemistry (3-3)** Miller, Ramaker  
 Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22 and 23; Math 31; Phys 21, 22; or permission of instructor. Prerequisite to Chem 112: Chem 111. (Academic year)
- 113 Physical Chemistry Laboratory (2)** Miller, DiLella  
 Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, \$35. (Spring)
- 122 Instrumental Analytical Chemistry (3)** Montaser  
 Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, with emphasis on electroanalysis, atomic and molecular spectrophotometry, mass spectrometry, and chromatography. Correlated with Chem 123. Prerequisite or concurrent registration: Chem 111 or permission of instructor. (Fall)
- 123 Instrumental Analytical Chemistry Laboratory (2)** DiLella  
 Laboratory complement to Chem 122. Prerequisite or concurrent registration: Chem 111 and 122. Laboratory fee, \$35. (Fall)



- 134 **Descriptive Inorganic Chemistry** (2) Rowley  
Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16, or 22 and 23, and 152. (Spring)
- 141-42 **Advanced Experimental Chemistry** (3-2) White, Caress, King  
Chem 141: Experimental methods common to all disciplines of chemistry, use of the chemical literature, interpretation of spectra by correlation methods, and operation of basic chromatographic and spectroscopic instrumentation. Chem 142: Advanced organic and inorganic laboratory techniques. Emphasis on individual work and on sophisticated methods for the separation, characterization, and identification of compounds. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111 or permission of instructor. Laboratory fee, \$35 per semester. (Academic year)
- 151-52 **Organic Chemistry** (3-3) Caress, Levy, King  
Introductory course for science majors, premedical students, and others preparing for related graduate work. Systematic treatment of the structure, preparation, properties, and reactions of the principal classes of organic compounds. Fundamental principles of stereochemistry, reaction mechanisms, and spectroscopic methods of analysis are included. Credit may not be earned for both Chem 50 and Chem 151-52. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)
- 153-54 **Organic Chemistry Laboratory** (1-1) Staff  
Laboratory complement of Chem 151-52. Introduction to and practice in basic skills of synthesis, separation, and purification of organic compounds. Prerequisite or concurrent registration: Chem 151-52. Prerequisite to Chem 154: Chem 153. Laboratory fee, \$35 per semester. (Academic year)
- 156 **Qualitative Organic Analysis** (3) King  
Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22 and 23, 154. Laboratory fee, \$35. (Spring, odd years)
- 191 **History of Chemistry** (2 or 3) Perros  
Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12. (Fall)
- 193 **Chemical Instrumentation** (3) Montaser  
Lecture (2 hours), laboratory (3 hours). Electronic analog measurements and control of electrical quantities in chemical instrumentation; digital and analog data conversion and optimization of electronic measurements in chemical instrumentation. Prerequisite: Chem 112 and 123 or permission of instructor. Laboratory fee, \$10. (Fall)
- 195 **Undergraduate Research** (1 or 2) Staff  
Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Majors are encouraged to take the course for 2 semesters. Laboratory fee, \$35 per semester hour. (Fall and spring)

### Third Group

- 207 **Chemical Bonding** (3) Ramaker  
Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)
- 211-12 **Physical Chemistry** (2-1) Miller, Ramaker  
Same as Chem 111-12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)
- 213 **Chemical Thermodynamics** (3) Miller  
Application of thermodynamics to chemical problems. Emphasis on statistical calculation of thermodynamic properties. Prerequisite: Chem 112 or 212. (Spring)



- 218 **Molecular Spectroscopy** (3) DiLella  
Applications of quantum mechanics and group theory to the interpretation of electronic, vibrational, rotational, and magnetic resonance spectroscopy. Prerequisite: Chem 207. (Spring, odd years)
- 221 **Advanced Analytical Chemistry I** (3) Montaser  
Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation, X-ray methods, and surface analysis techniques. Prerequisite: Chem 122. (Fall)
- 222 **Advanced Analytical Chemistry II** (3) Schmidt  
Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. (Spring, even years)
- 233 **Organometallic Chemistry** (3) White  
Survey of organometallic compounds, with emphasis on the compounds of lithium, boron, aluminum, silicon, and the transition metals and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)
- 235-36 **Advanced Inorganic Chemistry** (3-3) Staff  
Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)
- 251-52 **Advanced Organic Chemistry** (3-3) Filipescu  
Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)
- 257 **Physical-Organic Chemistry** (3) Levy  
The transition state theory of chemical kinetics, applications to reaction mechanisms; kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward-Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)
- 258 **Synthesis and Structure Determination in Organic Chemistry** (3) Staff  
The design of synthesis for complex organic molecules; survey of modern synthetic methods, including asymmetric induction; spectroscopic methods of structure determination. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)
- 259 **Polymer Chemistry** (3) Barkin  
A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 110 or 111 or permission of instructor. (Fall)
- 295 **Research** (arr.) Staff  
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, \$35 per semester hour. (Fall and spring)
- 298 **Independent Study** (3) Staff  
Limited to master's degree candidates. A survey of a topic approved by departmental staff and resulting in a written report, and the presentation of a seminar. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff

#### Fourth Group

- 350 **Choice and Design of a Research Problem** (1) Staff  
Development in written form of an original research plan, fully referenced, and its oral defense. If a grade of C is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)



**399 Dissertation Research** (arr.)

Limited to Doctor of Philosophy candidates. May be repeated for credit.  
and spring

Staff

(Fall)

**CHINESE**

See **East Asian Languages and Literatures.**

**CLASSICS**

Professor J.E. Ziolkowski

Associate Professor E.A. Fisher (Chair)

Assistant Professor M.D. Ticktin

Assistant Professorial Lecturer D.B. Beers

Instructor Y.M. Moses

*Bachelor of Arts with a major in classical humanities (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1-2, 3, 4; or equivalent; or Clas 11-12, 13-14; or equivalent; and Clas 71, 72.
3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 112, 155; Hist 105, 107, 108, 109, 110, 111, 209; Phil 111; PSc 105; Rel 143.

*Bachelor of Arts with a major in classical archaeology and classics (departmental)*—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1-2, 3, 4; or Clas 11-12, 13-14.
3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin. (A reading knowledge of French and German is recommended.)

*Minor in classical humanities*—(a) 6 semester hours selected from Clas 1-2 or 11-12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 107, 108, 113, 127, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

**COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH****First Group****1-2 Beginning Latin** (3-3)

Ziolkowski

Grammatical essentials of Latin, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

**3 Intermediate Latin: Prose and Poetry** (3)

Staff

Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1-2 or equivalent. (Fall)

**4 Vergil's Aeneid** (3)

Staff

Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

**11-12 Beginning Greek: Classical** (3-3)

Fisher

Study of the grammar, vocabulary, and structure of ancient Greek. Reading of selected ancient authors. (Alternate academic years)

**13-14 Intermediate Greek: Classical** (3-3)

Fisher

Reading of ancient Greek prose or poetic works (e.g., selections from Homer, Plato, Euripides). Review of grammar. Prerequisite: Clas 11-12 or equivalent. (Alternate academic years)



**21-22 Beginning Hebrew (4-4)**

An active presentation of Hebrew as it is spoken and written today. Comprehension, speaking, reading, and writing skills are stressed. Laboratory fee, \$35 per semester. (Academic year) Moses

**23-24 Intermediate Hebrew (3-3)**

Further development of skills in speaking, reading, writing, and comprehension of modern Hebrew. Texts range from Israeli newspaper items to selections from classical materials. Prerequisite: Clas 21-22 or equivalent. Laboratory fee, \$35 per semester. (Academic year) Ticktin

**25-26 Yiddish for Reading and Conversation (3-3)**

Grammatical essentials of the language, appropriate reading selections, conversational exercises for beginners. (Alternate academic years) Ticktin

**Second Group****103 Modern Hebrew Nonfiction (3)**

Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. May be repeated for credit. (Fall) Ticktin

**104 Modern Hebrew Fiction (3)**

Study of selected modern Israeli short stories and poems. May be repeated for credit. (Spring) Ticktin

**109-10 Major Latin Authors (3-3)**

Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3, 4; or permission of instructor. (Academic year) Ziolkowski

**139-40 Major Greek Authors (3-3)**

Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year) Staff

**185-86 Directed Reading (1, 2, or 3)**

Advanced reading in Greek, Hebrew, or Latin. Admission by permission of instructor. May be taken for graduate credit. Staff

**COURSES IN ENGLISH TRANSLATION****First Group****63 Greek and Latin Origins of Medical Terms (3)**

Mastery of medical terminology by learning word elements from Greek and Latin and the principles that govern both the formation of medical words and the derivation of their meanings. (Fall) Staff

**71 Greek Literature and Civilization (3)**

Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall) Ziolkowski

**72 Roman Literature and Civilization (3)**

Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring) Ziolkowski

**100 Modern Hebrew Literary Classics (3)**

Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Hazaz, Amichai, Oz, and Yehoshua. Discussions stress historical development and authors' treatments of tradition and modernity. Ticktin

**Second Group****101 Israeli Society and Culture: Literary Perspectives (3)**

A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall) Ticktin



- 102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin  
An introduction to post-1948 writers, including A.B. Yehoshua, Amos Oz, David Shahar, Aharon Apelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)
- 105 **Special Topics** (3) Staff  
Topics in Greek, Hebrew, Roman, and Yiddish literature; topics announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.
- 107 **Greek and Roman Mythology** (3) Fisher  
(Formerly Clas 108)  
The creation of the world, the nature of the gods, and the adventures of heroes as described in various Greek and Roman literary sources (e.g., epic, drama, hymns) and as shown in ancient art. Introduction to various theories about the nature and function of mythology (e.g., Jung, Levi-Strauss). (Fall)
- 108 **Approaches to Classical Mythology** (3) Fisher  
Selected classical myths examined through various disciplinary approaches, such as archaeology, psychology, history, and women's studies. (Spring)
- 113 **Greek and Roman Drama** (3) Staff  
Study of Greek and Roman tragedy and comedy; the nature and setting of dramatic performance in classical antiquity. (Spring)
- 127 **Classical Influence on Western Civilization** (3) Ziolkowski  
A survey of Greek and Roman influence on Western civilization, especially in architecture, language, literature, and science. Prerequisite: a course in classical literature or history.
- 170 **Women in Classical Antiquity** (3) Staff  
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

### COMMUNICATION\*

Professors W.M. Reynolds, C.H. Sterling, J.B. Manheim  
Associate Professors J.E. Thiel, R.S. Fortner (Chair), T.J. Brennan  
Assistant Professors S. Keller, M.A. Tolstedt, D.A. Durham, M. Keeler  
Adjunct Assistant Professors M.M. Travis, D. Havinga  
Instructor E.M. Murray

**Bachelor of Arts with a major in radio-television (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—18 semester hours in a single subject area outside the Communication Department as approved by the major advisor.
3. Required courses in the major—Comm 1, 75, 133, 134, 145, 199. Eighteen hours of second-group radio-television or film courses as approved by the major advisor. Nine of these hours must be in the 180-89 sequence.

**Bachelor of Arts with a major in speech communication (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Comm 1.
3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Communication as approved by the major advisor (the 12 hours in psychology or philosophy will partially fulfill the subject-area requirement).
4. Required courses in the major—Comm 112, 121, 126; 15 additional semester hours of second-group courses in the Communication Department as approved by the major advisor.

\* Courses and programs in the Communication Department may be revised significantly by fall 1989. Further information will be provided as soon as it is available. Admission to the department's majors is on a selective basis.



Minor in speech communication—18 semester hours of communication courses, including Comm 1, 112, 121, and 126; SpHr 11.

### First Group

- 1 Speech Communication (3)** Keller and Staff  
The study and practice of the basic principles and techniques of public speaking used to inform and persuade audiences. Emphasis on the speech building process: research, composition, organization, style, delivery, and criticism. Laboratory fee, \$5. (Fall and spring)
- 30 Television's View of America (3)** Travis  
The role of television entertainment and news programming in portraying the American people and interpreting their values and aspirations, their faults and frailties, their successes and failures, their heroes and villains. (Summer)
- 55 Introduction to Electronic Mass Media (3)** Staff  
Introduction to theory, forms, content, research, and societal role of American broadcasting and newer media as a process in communication. The course provides a context for studies in journalism, management, sociology, political science, and economics. (Summer)
- 75 Sight and Sound (3)** Thiel  
Development of a critical awareness of aural and visual communication through an introduction to the aesthetics, techniques, and organization of the creative process in electronic media. Lecture (2½ hours), laboratory (2 hours). Prerequisite: permission of instructor for nonmajors. Laboratory fee, \$25. (Fall and spring)
- 100 Communication Theory (3)** Murray  
Study of the various theoretical approaches that may explain the role of communication in society and its impact and practice. Examination of theories of rhetoric, communication, and mass communication, along with the biases, assumptions, and research methodologies of each approach. (Fall and spring)

### Second Group

- 111 Business and Professional Speaking (3)** Staff  
Study of the communication process in business and professional organizations; practice in interviewing, small group communication, and speeches for special occasions. Primarily for nonmajors. (Fall and spring)
- 112 Persuasion (3)** Keller  
In-depth study of the principles and techniques of persuasion, focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: Comm 1 or permission of instructor. (Spring)
- 121 Small Group Communication (3)** Murray  
The study and practice of communication in small groups focusing on problem solving, norms, roles, and leadership. Prerequisite: Comm 1 or permission of instructor. (Fall and spring)
- 126 Argumentation and Debate (3)** Reynolds  
Study of the advocacy process, with emphasis on issue identification, use of evidence, and logical proof. Practice in oral advocacy and argumentative speaking. Prerequisite: Comm 1 or permission of instructor. (Fall)
- 127 Forensic Practice (1)** Keller  
Student participation in intercollegiate speech activities. May be repeated for a total of 4 semester hours of credit. Admission by permission of instructor. (Fall and spring)
- 129 TV News: The Politics of Visibility (3)** Staff  
Same as Jour/PSc 129.
- 130 Radio and Television Production for Political Communication (3)** Havinga  
Basic concepts of radio and television as communications media, with emphasis on design and production techniques with applications in political communication.



- tion. Priority given to political communication majors. Laboratory fee, \$25.  
(Fall and spring)
- 132 **Radio-Television Performance** (3) Thiel  
Introduction to the basic theories and techniques required for effective, non-dramatic media performance (i.e., announcing, moderating, newscasting, etc.).  
Prerequisite: Comm 1. (Spring and summer)
- 133 **Development of American Electronic Media** (3) Sterling  
Study of the origins, structure, and nature of American broadcasting and related media. (Spring)
- 134 **Audio Production** (3) Tolstedt, Durham, Fortner  
Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production technique of a variety of audio programs. Lecture (2½ hours), laboratory (2 hours). Prerequisite: Comm 75 (for radio-television majors) or permission of instructor. Laboratory fee, \$25. (Fall and spring)
- 137 **Scriptwriting** (3) Tolstedt, Fortner  
Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and Comm 75 (for radio-television majors) or permission of instructor. (Fall)
- 142 **Topics in Electronic Media** (3) Staff  
Topic announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Summer)
- 143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds  
Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)
- 144 **History of Rhetoric in American Public Address** (3) Reynolds  
Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)
- 145 **Introduction to Television Production** (3) Keeler  
Basic course in television production techniques and skills. Directing, scriptwriting, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Lecture (2 hours), laboratory (2½ hours). Prerequisite: Comm 134. Laboratory fee, \$35. (Fall)
- 146 **Television Directing** (3) Thiel  
Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (3 hours). Prerequisite: Comm 145 and permission of instructor. Laboratory fee, \$35. (Spring)
- 171 **Language of Cinema** (3) Travis  
Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue, and mise-en-scène. Laboratory fee, \$25. (Fall)
- 173 **History of Cinema** (3) Travis  
An examination of the history, structure, and theory of motion pictures in America and abroad. Same as Art 173. Laboratory fee, \$25. (Fall)
- 174 **Special Studies in Film** (3) Staff  
In-depth study of specific film topics. Laboratory fee, \$25. Prerequisite: Comm 173. (Spring)
- 175 **The Political Image** (3) Travis  
An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. Laboratory fee, \$25. (Spring, even years)
- 176 **Film as Fact and Fiction** (3) Travis  
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. Laboratory fee, \$25. (Spring, odd years)



- 180 **Regulation and Policy in Electronic Media** (3) Sterling  
Legal, technical, political, economic, and social aspects of radio, television, and cable and related delivery systems. Structure and operation of FCC and other agencies, plus role of Congress and courts. Consideration of problems in spectrum allocation, behavioral regulation, the trend to deregulate political influence, and current policy matters. Prerequisite: Comm 133. (Fall)
- 181 **Inside Television: Corporate Strategy and Management** (3) Brennan  
Seminar on the operations and decision-making activities of the television industry: networks, affiliates, independent stations, public television, and cable/satellite organizations. Topics include programming, sales, representation, promotion, ratings, and legal constraints. Prerequisite: Comm 133. (Spring)
- 182 **Innovation in Electronic Media** (3) Durham  
Examination of current and future trends in electronic media, with emphasis on radio, television, and cable, including developments in technology, programming, industry structure, and public policy. Prerequisite: Comm 133. (Fall)
- 184 **International Communication** (3) Fortner  
Examination of the historical and present communication activities of major international news-gathering and broadcasting organizations, international communications policy forums, organizations and treaties, spectrum allocation criteria, communications technology, programming development, and trade. The role of international propaganda as a policy tool; the current debate over a "New World Information order." (Spring, even years)
- 185 **Comparative Communication Systems** (3) Fortner  
In-depth study of the developmental, regulatory, political, economic, and cultural dimensions of selected foreign communication systems; emphasis on broadcasting, cable, and satellite applications. Prerequisite: Comm 133. (Spring)
- 187 **Seminar: Topics in Communication** (3) Staff  
Topic announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Fall and spring)
- 189 **Effects of Electronic Media** (3) Durham  
Current concepts of the impact of broadcasting and related media on audiences; social science research findings and methods, including persuasion, formation of opinion, media and personal interaction, violence, audience characteristics and media use patterns, and development of related theories and models of mass communication. Prerequisite: Comm 133. (Spring)
- 196 **Independent Study** (1 to 6) Staff  
Independent research and special projects. Open to seniors or exceptionally well-prepared juniors majoring in speech communication. Before students are permitted to register for Comm 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.
- 197 **Internship: Radio and Television** (3) Thiel  
Open to seniors majoring in radio-television. Students will spend at least 16 hours a week during the semester in an approved media position with local nonprofit, corporate, or commercial organizations. Seminar meetings, reports, and career-oriented projects. Admission requires departmental approval. May be repeated once for credit. (Fall and spring)
- 199 **Senior Seminar in Communication** (3) Staff  
Capstone course providing a survey and integration of the major viewpoints and concepts of radio and television. Reading, research, and class discussions on selected topics. Under the guidance of an instructor, the student writes a major research paper on an approved topic. Limited to radio-television majors. Prerequisite: all radio-television required courses or permission of instructor and the major advisor. (Fall)



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**COMPUTER AND INFORMATION SYSTEMS**

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See **Statistics/Computer and Information Systems**.

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**COUNSELING**

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See **Human Services**.

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**CRIME IN COMMERCE**

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See **Forensic Sciences**.

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**CRIMINAL JUSTICE**

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See **Sociology** for the Bachelor of Arts with a major in criminal justice.

See **Forensic Sciences** for the Master of Arts in the field of criminal justice.

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**DANCE**

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See **Theatre and Dance**.

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**DRAMA**

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See **Theatre and Dance**.

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**EARLY MODERN EUROPEAN STUDIES**

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**Committee on Early Modern European Studies**

R.E. Kennedy, Jr. (Chair), I. Azar, C.A. Linden, J.A. Quitslund, L.F. Robinson, R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, science, literature, and art of the five centuries (1300-1800) during which the Western world began to take on its modern dimensions. The program is directed by an interdepartmental committee.

*Bachelor of Arts with a major in early modern European studies*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Requirements for the major:
  - a. The core interdisciplinary course Individualism, Reason, and Tradition in Early Modern Europe (Hist/Engl/Fren/Ger/Rel 183, and Art 187).
  - b. Six semester hours of second-group French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121, 122, 123; Ger 103-4, 111-12, 131-32; Span 120, 121, 122-23, 124.
  - c. Phil 112; Rel 145; PSc 106.
  - d. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following groups: Art 104-5, 106-7, 108, 113-14, 121-22; Engl 125-26, 127-28, 129, 130, 131-32; Hist 101, 105, 121-22, 123, 141, 148, 151, 153, 154.

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**EAST ASIAN LANGUAGES AND LITERATURES**

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Professor C.W. Shih (Chair)

Associate Professors J. Chaves, D.L. Lee, Y.-K. Kim-Renaud

Associate Professorial Lecturer M.-J.C. Loh



Assistant Professor G.C.Y. Wang  
 Instructor T. Kimura  
 Lecturers L.Y.C. Jiordano, N.H. Kuo

*Bachelor of Arts with a departmental major in Chinese language and literature*—The requirements are as follows:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Chin 5-6 (preferred); or Chin 1-2, 3-4.
3. Required for the major—Chin 11-12, 107-8, 109-10, and 163-64 or 181-82; plus 12 additional semester hours of second-group Chinese courses.

*Minor in Chinese language and literature*—Prerequisite: 18-22 credit hours, including either Chin 1-2, 3-4, and 11 or Chin 5-6 and 11. The minor consists of 12 additional credit hours selected from Chin 12, 107-8, 109-10, 123-24, 163-64, 179-80, or 181-82.

## CHINESE

### First Group

- 1-2 **Beginning Mandarin Chinese, Part I** (3-3)  
 Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, \$35 per semester. (Academic year) Wang
- 3-4 **Beginning Mandarin Chinese, Part II** (3-3)  
 Continuation of grammar and spoken Chinese, with more emphasis on the written language and reading. Laboratory fee, \$35 per semester. (Academic year) Wang
- 5-6 **Beginning Intensive Mandarin Chinese, Parts I-II** (8-8)  
 Intensive beginner's course in fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, \$35 per semester. (Academic year) Lee
- 10 **Chinese Calligraphy** (1)  
 Writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring) Loh
- 11-12 **Intermediate Intensive Mandarin Chinese** (6-6)  
 Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6. Laboratory fee, \$35 per semester. (Academic year) Wang
- 22 **Intermediate Chinese Conversation** (3)  
 A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit. (Fall and spring)

### Second Group

- 107-8 **Readings in Modern Chinese** (3-3)  
 Readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year) Staff
- 109-10 **Introduction to Classical Chinese** (3-3)  
 Introduction to classical writings in Chinese literature, history, and philosophy. Prerequisite: Chin 6. (Alternate academic years) Shih, Chaves
- 123-24 **Introduction to Chinese Linguistics** (3-3)  
 Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Alternate academic years) Lee
- 161-62 **Chinese Culture Through Films** (3-3)  
 Survey of the Chinese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English. Shih
- 163-64 **Chinese Literature in Translation** (3-3)  
 An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year) Chaves



- 179-80 **20th-Century Chinese Literature** (3-3) Shih  
Works of Lu Xun, Lao She, and others. Drama of Tian Han and Cao Yu. Prerequisite: Chin 107 or equivalent. (Alternate academic years)
- 181 **Literature in Traditional Chinese Society—in Translation** (3) Chaves  
Introduction to the various roles played by literature in pre-modern China, as well as the reflection of society in traditional literature.
- 182 **Literature in the People's Republic of China—in Translation** (3) Chaves  
Survey of stories, poems, and plays in the PRC and their role in political and social events.
- 185-86 **Directed Reading** (3-3) Staff  
Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)
- 199-200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3-3) Staff  
Conferences and group discussions. (Academic year)

### Third Group

- 271-72 **Poetry of the Tang and Song Periods** (3-3) Chaves  
Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent. (Alternate academic years)
- 273 **Yuan Drama** (3) Shih  
Readings of plays by Guan Han-qing, Ma Zhi-yuan, and others. Prerequisite: Chin 109 or equivalent.
- 277-78 **Prose Narratives of the Song, Ming, and Qing Periods** (3-3) Shih  
Short stories of the Song period. Selected readings of Ming/Qing novels. Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent. (Alternate academic years)
- 299-300 **Thesis Research** (3-3)

### JAPANESE

#### First Group

- 1-2 **Beginning Japanese, Part I** (4-4) Kimura, Kuo  
Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, \$35 per semester. (Academic year)
- 3-4 **Beginning Japanese, Part II** (4-4) Kimura, Kuo  
Continuation of grammar, with more emphasis on written language and reading. Laboratory fee, \$35 per semester. (Academic year)
- 5-6 **Intermediate Japanese, Part I** (3-3) Kimura  
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, \$35 per semester. (Academic year)
- 7-8 **Intermediate Japanese, Part II** (3-3) Kimura  
Continuation of reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, \$35 per semester. Prerequisite: Japn 5-6. (Academic year)

#### Second Group

- 111-12 **Japanese Literature in Translation** (3-3) Chaves  
An introductory survey of traditional and modern Japanese literature read in English translation: love and nature poetry; theater (classical drama, puppet plays); fiction; diaries. Particular emphasis is placed on the great women writers of Japan. (Academic year)
- 162 **Japanese Culture Through Films** (3) Shih, Chaves  
Survey of the Japanese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English. (Spring)



## KOREAN

## First Group

1-2 **Beginning Korean, Part I** (4-4)

Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, \$35 per semester. (Academic year) Kim-Renaud

3-4 **Beginning Korean, Part II** (4-4)

Continuation of grammar, with more emphasis on written language and reading. Laboratory fee, \$35 per semester. (Academic year) Kim-Renaud

5-6 **Intermediate Korean** (3-3)

Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, \$35 per semester. (Academic year) Kim-Renaud

## EAST ASIAN STUDIES

Program Committee: W.R. Johnson (Director), H.C. Hinton, Y.C. Kim, C.W. Shih, R. Thornton, R.Y. Yin

The Elliott School of International Affairs offers multidisciplinary programs leading to a Bachelor of Arts with a major in East Asian studies (with a focus on either China or Japan) and a Master of Arts in the field of East Asian studies.

*Bachelor of Arts with a major in East Asian studies*—The following requirements must be fulfilled.

1. The general requirements stated under the Elliott School of International Affairs.
2. Prerequisite courses—see the Elliott School of International Affairs, Curriculum Requirements.
3. Required courses for the major—for the China focus: Chin 5-6, 11, and either 163 or 164; Econ 169; for the Japan focus: Japn 1-2, 3-4, either 111 or 112, and 3 additional hours in Japanese language; Econ 170; for both the China and Japan focus: one course selected from Geog 127, 132, 133, 134, 146, 266; three courses selected from Hist 137, 188, 189, 195, and either 187 or 196 (courses covering both premodern and modern periods are recommended); PSc 170 or 173; three 100-level elective courses in economics, history, or political science that are not related to China or Japan and that are selected in consultation with the advisor.
4. Preparation of a substantial research paper in a two-semester research course or independent study related to the chosen focus on China or Japan. The courses taken to fulfill this requirement must be approved in advance by the program director.

*Master of Arts in the field of East Asian studies*—Prerequisite: the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. Required: the general requirements stated under the Elliott School.

The program is available in a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. Students electing the nonthesis option must prepare a substantial research paper in a two-semester readings/research course. (In the concentration in Chinese language and literature, only the thesis option is available.) Students with no previous course work in the modern history and politics of China and Japan may need to take additional courses beyond the minimum required for the degree to acquire this background. A reading knowledge of Chinese, Japanese, or another approved East Asian language must be demonstrated. Credit for language study is not counted toward degree requirements.

Students must complete course work related to East Asia in at least four of the following Departments: East Asian Languages and Literatures, Economics, Geography and Regional Science, History, and Political Science. (Those who choose the concentration in Chinese language and literature are excepted.)

Students in the thesis program must pass Master's Comprehensive Examinations in two fields, one in a major field (12 credit hours) and one in a minor field (6 credit hours). Students in the nonthesis program must pass the Examinations in three fields if they select one major field and two minor fields and in two fields if they select two major fields.



Concentration in Chinese language and literature—only the thesis option is available. Students must take 12 credit hours of Chinese literature and pass a Master's Comprehensive Examination in this major field. They must also take 6 hours of history courses and 6 hours of additional courses that pertain to East Asian studies and must pass a Master's Comprehensive Examination in one of these two minor fields.

The following graduate courses pertain to East Asian studies.

Chin 271-72	Poetry of the Tang and Song Periods
Chin 273	Yuan Drama
Chin 277-78	Prose Narratives of the Song, Ming, and Qing Periods
Econ 269-70	Economy of the People's Republic of China
Econ 271	Economy of Japan
Geog 266	Seminar: Geographic Perspectives on Contemporary China
Hist 253-54	Readings Seminar: History of Sino-Soviet Relations
Hist 255-56	Readings Seminar: U.S.-Soviet Strategic Relations Since World War II
Hist 259-60	Research Seminar: Problems in U.S.-Soviet-Chinese Relations
Hist 289	Readings/Research Seminar: Modern Japanese History
Hist 293	Research Seminar: Modern East Asian History
Hist 295-96	Readings Seminar: Modern Chinese History
IAff 291	Colloquium: East Asia
PSc 270-71	Politics of the People's Republic of China
PSc 272	Foreign Policy of the People's Republic of China
PSc 275	International Politics of the Far East
PSc 276	Governments and Politics of Japan and Korea

## ECONOMICS

Professors J.W. Kendrick (Emeritus), C.T. Stewart, Jr., J. Aschheim, H. Solomon, C.Y. Hsieh (Emeritus), J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E. Haber, A. Adams, R.S. Goldfarb, O. Havrylyshyn, A.M. Yezer, J.J. Cordes, J. Pelzman, J.E. Kwoka, R.P. Trost, B.L. Boulter (Chair)

Adjunct Professors T.F. Carroll, P. Swamy, J. Hardt, V. Tanzi, E.H. Solomon

Professorial Lecturers R.E. French, K.S. Flamm

Associate Professors R.Y. Yin, H.S. Watson, M.D. Bradley, S.C. Smith, T.J. Brennan

Adjunct Associate Professor M.A. Baily

Associate Professorial Lecturer S.N. Kirby

Assistant Professors V. Fon, M.B. Loewy, M.-H. Ye, R.F. Phillips, F.L. Joutz, J.W. Keating, M.O. Moore, S.M. Suranovic

*Bachelor of Arts with a major in economics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—Econ 1-2.
3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; 6 semester hours of a social science other than economics.
4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

*Minor in economics*—(a) 18 credit hours in economics, including Econ 1, 2, 101, 102, 121, and one other 100-level course in economics; (b) 6 credit hours of an approved statistics sequence, such as Stat 111-12; or 6 hours selected from Math 31, 32, 41-42, 51-52; or 3 hours of an approved statistics course plus 3 hours selected from Math 31, 32, 41-42, 51-52.

*Master of Arts in the field of economics*—Prerequisite: (1) a Bachelor of Arts degree with a major in economics or with course work in economics that includes intermediate microeconomic and macroeconomic theory (equivalent to Econ 101, 102 or 217-18); (2) an understanding of basic calculus, equivalent to Math 31-32 or 41-42; (3) Graduate Record Examinations for all applicants except international students who attended universities in



which the language of instruction is not English. Applications are accepted for the fall semester only.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 203-4, 205, and 275; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; and (4) either a thesis (Econ 299-300) or 12 semester hours selected from additional third-group economics courses. In some cases, up to 6 semester hours in courses outside the Department may be substituted for certain of the above requirements when it is deemed clearly important to the candidate's area of study.

*Doctor of Philosophy in the field of economics*—The Ph.D. program involves study in two sequential units. Unit I includes satisfactory completion of required course work, and passing the General Examination. This first unit must be concluded within five years after entry into the program. Upon successful completion of Unit I, students are considered for admission to Unit II, the dissertation stage, which must be completed within five years after entry. In all cases, however, the student is expected to complete the doctorate within eight years after admission. Students admitted to the second unit will be recommended by the Department of Economics for the Master of Philosophy degree.

Students must meet the general requirements stated under the Graduate School of Arts and Sciences. For Unit I, the requirements include Econ 202, 203, 204, 205, 206, 215, 216, and 275, plus 24 additional semester hours of approved graduate course work, and passing the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee. Examinations are given in the following fields: econometrics, economic development, environmental and natural resource economics, health economics, history of economic thought, industrial organization, international economics, labor economics, monetary theory and policy, public finance, regional and urban economics, and Soviet and East European economics.

Examinations: the field examinations that constitute the General Examination are given at least two times per year. The requirements for the microeconomic and macroeconomic theory examinations must be met before any other field examinations may be taken. Students are strongly advised to take the microeconomic and macroeconomic theory examinations within two years of entering the program. To pass the General Examination, students must earn a grade of "satisfactory pass" or better in the field examination in microeconomic or macroeconomic theory and in one of the other two field examinations and no grade below "bare pass." Two of the field examinations may be taken a second time with the approval of the department and the dean. No further opportunity to take the examinations is permitted. Substitution of a field examination (in an area not originally chosen by the student) to satisfy the requirements of the General Examination is equivalent to taking a field examination a second time. Students should consult with the professors responsible for their fields and notify the department two months in advance of their intention to take the examinations. If such notification is not given sufficiently in advance, it may not be possible to sit for the examination. These examination requirements apply in full to all students who entered the economics Ph.D. program in the 1979 fall semester and thereafter.

For Unit II, the requirements include formulation of an acceptable dissertation proposal, completion of a dissertation that demonstrates the candidate's ability to do original research, and 24 hours of additional graduate course work, of which at least 12 hours must be dissertation research. Students, including those who have an accepted dissertation proposal, must enroll in a dissertation proposal seminar (Econ 397) in the first semester after promotion to Unit II. Satisfactory performance in the seminar will be equivalent to 3 semester hours of Unit II course work. In cases where knowledge outside the discipline of economics is critical to the student's research field, up to 6 semester hours in Unit II may consist of required courses outside of the Economics Department.

**Departmental prerequisite:** Econ 1-2 is prerequisite to all other courses in economics except Econ 217-18.



## First Group

## 1-2 Principles of Economics (3-3)

Dunn, Goldfarb, Loewy, Trost

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: Macroeconomics—national income concepts, unemployment and inflation, institutions of monetary control. Econ. 2: Microeconomics—supply and demand, the price system and how it works, competitive and monopolistic markets. (Econ 1 and 2—fall and spring)

## Second Group

## 101 Intermediate Microeconomic Theory (3)

Yezer, Fon, Goldfarb, Phillips

Analysis of household economic behavior, including derivation of demand functions. Analysis of firm behavior, including derivation of supply frameworks. Demand and supply interaction under various market structures and in factor markets. (Fall and spring)

## 102 Intermediate Macroeconomic Theory (3)

Yin, Bradley, Loewy

Investigation of the determinants of national income, inflation, unemployment, and interest rates. Alternative business cycle theories, with emphasis on the role of imperfect information, uncertainty, and expectations. (Fall and spring)

## 104 History of Economic Thought (3)

Staff

History of the major schools of economic thought, influence of changing problems on the development of economic theory. Prerequisite: Econ 101, 102.

## 105 Economic Conditions Analysis and Forecasting (3)

Staff

Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

## 121 Money and Banking (3)

Joutz, Keating

The role of money, credit, interest rates, foreign exchange rates, and commercial banks and other financial institutions in the U.S. economy. (Fall and spring)

## 122 Monetary Theory and Policy (3)

E. Solomon

Analysis of classic and modern monetary theories and their application to current economic conditions. The links between theory and policy. The altered role of money over time; the new money technology. (Spring)

## 123 Introduction to Econometrics (3)

Trost, Phillips

Joint offering of the Economics and Statistics Departments. Construction and testing of economic models; regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Math 31 or 41; Stat 112. (Spring)

## 130 Comparative Economic Systems (3)

Aschheim

Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

## 133 Economy of the Soviet Union (3)

Pelzman, Hardt

Analysis and review of the economic development and performance of the Soviet Union from the pre-revolutionary period to the present. (Fall)

## 134 Comparative Communist Economic Systems (3)

Pelzman, Hardt

Analysis and review of the economic development and performance of the East European economies in the post-World War II period. Soviet-type and alternative planning models. (Spring)

## 136 Natural Resources and Environmental Economics (3)

Yezer

Analysis of market mechanisms that allocate energy and natural and environmental resources; investigation of actual and optimal resource allocation across uses and time; review of arguments for public intervention. (Spring)

## 141 Women in the Labor Market (3)

Haber

Application of theories of the household and of human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Spring)



- 142 **Labor Economics** (3) Haber  
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wage differentials; labor market issues and policies. (Fall)
- 148 **Health Economics** (3) Bailey  
Economic analysis of the determinants of demand, supply, output, and distribution in the health care sector, with special emphasis on current policy issues of access, quality, and cost. (Fall)
- 151 **Economic Development** (3) Havrylyshyn, Smith  
Theories and empirical studies of the economic problems of developing countries. (Fall and spring)
- 153 **Income Distribution** (3) Haber  
An analysis of the distribution of income, with focus on issues relating to wealth and poverty. (Spring)
- 157 **Urban and Regional Economics** (3) Yezzer  
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.
- 158 **Industrial Organization** (3) Kwoka  
Analysis of market structure, conduct, and performance of firms in a market economy, with emphasis on case studies of U.S. industries. (Fall)
- 159 **Government Regulation of the Economy** (3) Kwoka  
Economic analysis of antitrust and regulation in the American economy. Prerequisite: Econ 158 or 101. (Spring)
- 161 **Public Finance I** (3) Cordes, Watson  
Theoretical and institutional analysis of government expenditures and intergovernmental fiscal relations. (Fall)
- 162 **Public Finance II** (3) Cordes, Watson  
Theoretical and institutional analysis of tax policy and debt management. (Spring)
- 165 **Economics of Human Resources** (3) Stewart  
Economic analysis of education and training, research and innovation, and their relation to economic growth. (Fall)
- 169 **Introduction to the Economy of the People's Republic of China** (3) Yin  
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)
- 170 **Introduction to the Economy of Japan** (3) Staff  
Analysis of the structure and growth of the Japanese economy. (Spring)
- 179 **U.S. Economic History** (3) Berkowitz  
Same as Hist 179.
- 181-82 **International Economics** (3-3) Dunn, Pelzman, Moore, Suranovic  
Econ 181: International trade theory and international monetary theory. Econ 182: Continuation of international monetary theory; economic development. (Academic year)
- 185 **Economic History and Problems of Latin America** (3) Staff  
Analysis of present structures and problems of Latin American economies. (Spring)
- 195 **Special Topics in Economics** (3) Staff  
Topics vary, depending on current issues of interest and faculty availability. (Fall and spring)
- 198 **Proseminar in Economics** (3) Aschheim, Stewart  
Preparation and presentation of a research paper in any field of economics agreed upon by student and instructor. Review of selected topics in contemporary economics. Open only to economics majors in their senior year. (Fall and spring)
- 199 **Independent Research in Economics** (3) Staff  
Under the personal direction of an instructor. Limited to economics majors with demonstrated capability. Prior approval of instructor required. (Fall and spring)



### Third Group

Third-group economics courses (except 211, 212, 214, 217-18, 221-22, 243, 247, 249, 283-84, 290, 291) are designed for graduate students in economics. Graduate students in other disciplines may register for third-group courses after having completed Econ 217-18 or 101 and 102, unless the course description indicates that these prerequisites have been waived. In addition to these prerequisites and any others specific to the particular course, calculus is required in some sections of third-group economics courses.

- 202 History of Economic Thought (3)** Staff  
Critical analysis and interpretation of the development of economic theory from Plato through the formulation of the Neoclassical Synthesis paradigm and contemporary revisions of the Neoclassical Synthesis. (Fall)
- 203-4 Microeconomic Theory (3-3)** Fon, Ye  
Econ 203: Demand, production, cost theory. Prerequisite: Econ 101 or equivalent.  
Econ 204: Market structure, welfare, general equilibrium. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)
- 205 Macroeconomic Theory I (3)** Bradley, Loewy  
Alternative theories of income, employment, and the price level; fiscal and monetary policy impacts; the role of expectations in the economy. (Fall and spring)
- 206 Macroeconomic Theory II (3)** Bradley  
Continuation of Econ 205. Extensions of alternative models of income determination; application of analytic frameworks to the U.S. economy; examination of uncertainty and policy strategy. (Fall and spring)
- 208 National Income, Product, and Productivity (3)** Kendrick  
Output, input, and productivity relationships by industry; income, outlay, flow-of-funds, and balance sheets by sector; uses of accounts for analysis and projections. (Fall)
- 211 Analytic Methods for Management and Policy I (3)** Staff  
Primarily for graduate students in fields other than economics. Various quantitative techniques, such as simulation, cost-benefit analysis, mathematical programming, and difference equations, and their roles in policy analysis are analyzed theoretically and in a management/policy context. Prerequisite: Stat 51 and Econ 217 or equivalent. (Fall)
- 212 Analytic Methods for Management and Policy II (3)** Staff  
Primarily for graduate students in fields other than economics. A more advanced treatment of the quantitative techniques introduced in Econ 211, including cost-benefit analysis and mathematical programming techniques. Additional topics include applications of game theory, econometric modeling, and simulation models to policy analysis. Prerequisite: Econ 211. (Spring)
- 214 Survey of Mathematical Economics (3)** Fon  
Primarily for graduate students in fields other than economics. Students in economics should consult the instructor before taking this course. Topics include differentiation, partial differentiation, and economic optimization problems; comparative statics; input-output analysis; difference, differential equations, and economic applications. Prerequisite: one semester of calculus and Econ 217-18.
- 215-16 Mathematical Economics (3-3)** Fon  
Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates with permission of instructor. (Academic year)
- 217-18 Survey of Economics (3-3)** Goldfarb, Haber, Holman, Watson  
Intermediate-level microeconomic theory (Econ 217) and intermediate-level macroeconomic theory (Econ 218) for graduate students in fields other than economics. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)
- 221-22 Applied Economics (3-3)** Adams  
An extension of microeconomic welfare analysis to the study of contemporary policy issues, with an emphasis on resource allocation decisions in the public



- sector; models of individual choice making in policy analysis; and policy aspects of production, cost, and organizational decision making. Primarily intended for students in fields other than economics. Prerequisite: Econ 217 or equivalent. (Academic year)
- 223-24 **Monetary Theory and Policy** (3-3) Aschheim  
Theory of monetary policy within the framework of contemporary American central banking. (Academic year)
- 233 **Rural Development Policies** (3) Carroll  
Review of poverty-oriented rural development strategies in the LDCs. Theories and experiences of land reform, peasant cooperatives, small-farm technology, rural-urban linkages, and planning a rural service network. (Fall)
- 237 **Economics of the Environment and Natural Resources** (3) Holman  
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)
- 239 **Economics of Defense** (3) H. Solomon  
Economic analysis applied to national security planning and objectives. Analysis of defense establishment problems, including manpower, the defense industry base, procurement policy. (Spring)
- 241-42 **Labor Economics** (3-3) Goldfarb  
Theory of wages and employment, analysis of labor supply and demand. Analysis of unemployment; unions; wage regulation. Econ 241 is prerequisite to Econ 242. (Academic year)
- 245-46 **Industrial Organization** (3-3) Kwoka  
Econ 245: Economic theory and evidence regarding industrial market structure, conduct, and economic performance. Econ 246: Economic issues in antitrust and government regulation of the U.S. economy. Econ 245 is prerequisite to Econ 246. (Academic year)
- 247 **Seminar: Industrial Organization** (3) Brennan  
Selected topics in regulatory and antitrust economics. Prerequisite: Econ 101. 217, or equivalent. Offered off campus only. (Spring)
- 248 **Health Economics** (3) Bailly  
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency, and allocation of health care services. (Spring)
- 249 **Industrial Organization—The Telecommunication Industry** (3) Brennan  
Principles of industrial organization, welfare economics, and theories of regulation, in principle and in practice. Market power, merger analysis, vertical relationships, entry, and regulation of price and lines of business. The study of market performance and business practices of the telecommunication industry. Prerequisite: Econ 217. Offered off campus only.
- 251 **Economic Development Theories** (3) Havrylyshyn, Smith  
Basic theories of economic growth and development. Issues covered may include measurement of economic growth; industrialization of agrarian economies; income distribution, employment, and poverty; international trade policies; debt problems of developing countries. (Fall and spring)
- 252 **Economic Development Planning** (3) Havrylyshyn, Smith  
Theories and techniques of development planning and the experience in developing countries. Emphasis on tools of planning, particularly macro models, multisector models (including input-output, social accounting, linear programming, and computable general equilibrium models), and cost-benefit analysis in project appraisal. (Fall and spring)
- 255 **Economics of Technological Change** (3) Stewart  
Economics of research and development; innovation and growth; the role of government in the development and use of new technology. (Spring)
- 257 **Regional Economics** (3) Yezer  
Study of regional planning and growth models, including input-output, programming, and econometric models used by planning agencies; analysis of interregional production, trade, migration, firm location, and pricing models. (Fall)



- 258 **Urban Economics** (3) Yezer  
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)
- 259 **Income Distribution** (3) Stewart  
Theoretical and empirical analysis of income distribution; the sources of inequality; evaluation of redistribution policies and their consequences. (Spring)
- 263 **Theory of Public Finance I** (3) Cordes, Watson  
Allocation and distribution aspects of government budget policy, including critical analysis of expenditure theories and principles, and intergovernmental fiscal relations. (Fall)
- 264 **Theory of Public Finance II** (3) Cordes, Watson  
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)
- 267 **Seminar: Soviet Economy** (3) Pelzman, Hardt  
An analysis of the Soviet economy. Issues discussed include growth strategy, investment and price policy, and foreign trade and aid strategy. Admission by permission of instructor. (Fall)
- 268 **Seminar: Economic Theory and Development in Communist Countries** (3) Pelzman, Hardt  
An analysis of the application of Soviet-type growth models to Eastern Europe and the resulting reforms. Admission by permission of instructor. (Spring)
- 269 **Economy of the People's Republic of China I** (3) Yin  
Analysis of organization, operation, policies, and problems. Development of the economy since 1949. (Fall)
- 270 **Economy of the People's Republic of China II** (3) Yin  
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)
- 271 **Economy of Japan** (3) Staff  
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)
- 275 **Econometrics I: Introduction** (3) Trost, Phillips  
Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Topics include heteroscedasticity, serial correlation, and lagged dependent variables. Prerequisite: Econ 123. Some exposure to matrix algebra is helpful, but not required. Same as Stat 275. (Fall and spring)
- 276 **Econometrics II: Simultaneous-Equation Models** (3) Trost, Phillips  
Simultaneous-equation models of economic behavior. Optional topics are maximum-likelihood estimation, limited dependent variables, and quantum-response models. Prerequisite: Econ 275. Recommended: a course in matrix algebra. Same as Stat 276. (Spring)
- 277 **Laboratory in Applied Econometrics** (3) Trost  
Application of econometric theory. Use of econometric software. Each student will be required to write an empirical research paper. Prerequisite: Econ 275 or, with the permission of the instructor, Econ 123.
- 281-82 **International Trade Theory and International Finance** (3-3) Dunn, Pelzman  
Econ 281: International trade theory, including alternative models of the gains from trade and evaluations of the new justifications for protectionism, and analysis of commercial policy, factor flows, and trade and investment with multinational corporations. Econ 282: International finance, including alternative models of balance of payments behavior and adjustment, payments accounting, exchange markets, and alternative exchange-rate regimes. Prerequisite: some sections may require calculus or permission of instructor.



- 283-84 Survey of International Economics and Policy (3-3)**  
 For graduate students in fields other than economics. Econ 283: Survey of international economics and policy; application of comparative advantage and other arguments for trade; impact of trade on a domestic economy; new arguments for protectionism; regional trading blocs. Econ 284: International finance; balance of payments accounting; exchange markets; alternative models of balance of payments determination and adjustment; behavior of flexible exchange rate systems. (Academic year) Staff
- 285-86 Economic Development of Latin America (3-3)**  
 Econ 285: Diversity of structures of Latin American economies; import substituting industrialization; inflation; problems of underemployment and income distribution. Econ 286: Structure of trade; protection, exports, and economic development; regional and global economic integration; foreign investment, multinational enterprise, and technology transfer. (Academic year) Flamm
- 287 Seminar: Problems in Latin American Civilization (3)**  
 Same as IAff 287. Staff
- 290 Principles of Demography (3)**  
 Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. Departmental prerequisite waived. Same as Geog/Soc/Stat 290. (Fall) Boulter
- 291 Methods of Demographic Analysis (3)**  
 Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. Departmental prerequisite waived. Same as Geog/Soc/Stat 291. (Spring) Boulter
- 295 Special Topics in Economics (3)**  
 Topics vary, depending on current issues of interest and faculty availability. (Fall and spring) Staff
- 298 Reading and Research (3)**  
 Limited to master's degree candidates. (Fall and spring)
- 299-300 Thesis Research (3-3)**  
 (Fall and spring)

#### Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires and may be repeated for credit with permission of the instructor.

- 305 Seminar: Macroeconomics (3)**  
 Selected topics in macroeconomics. Prerequisite: Econ 205. Bradley, Loewy
- 310 Economic Methodology (3)**  
 Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. Goldfarb, Stewart
- 312 Seminar: Price Theory (3)**  
 Selected topics in price theory. Staff
- 315 Seminar: Topics in Mathematical Economics (3)**  
 Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215-16. H. Solomon, Fon, Ye
- 321 Seminar: Monetary Theory (3)**  
 Recent developments in monetary theory. Aschheim, Bradley, Loewy
- 341 Seminar: Labor Economics (3)**  
 Current problems in theory and policy. Goldfarb
- 345 Seminar: Industrial Organization (3)**  
 Review of recent literature and current policy issues. Admission by permission of instructor. Kwoka
- 348 Topics in Health Economics (3)**  
 Advanced topics in health economics. Prerequisite: Econ 248 or permission of instructor. Staff



- 351 **Seminar: Economic Development** (3) Havrylyshyn, Smith  
Analysis and review of recent theoretical work and/or selected topics of current policy interest. Prerequisite: Econ 251 and 252 or permission of instructor.
- 363 **Seminar: Public Finance** (3) Cordes, Watson  
Selected topics of current interest.
- 367 **Seminar: Soviet Planning in Theory and Practice** (3) Pelzman  
Analysis and review of recent work on planning theory as applied to the Soviet Union. Marxist ideology with modification is taken as the primary force shaping the objective function of Soviet planners. Soviet economic performance is evaluated based on this criterion. Prerequisite: Econ 203-4 and 267 or permission of instructor.
- 378 **Seminar: Topics in Econometrics** (3) Swamy  
Research seminar covering current econometric literature and special topics. Admission by permission of instructor. Same as Stat 378.
- 379-80 **Readings in Economic History** (3-3) Staff  
Joint offering of the Economics and History Departments. Econ 379: American economic history. Econ 380: Modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)
- 390 **Seminar: International Economic Theory** (3) Dunn, Pelzman  
Primarily for doctoral students. Examination of recent contributions in this field.
- 391 **Seminar: International Economic Policy** (3) Staff  
Topics selected from current significant policy problems.
- 397 **Dissertation Proposal Seminar** (3) Staff  
Limited to Doctor of Philosophy candidates in Unit II. Critical analysis of current research. Formulation of a dissertation proposal and development of dissertation research strategies.
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## EDUCATIONAL LEADERSHIP

Professors M.N. Rashid, J.G. Boswell, D.A. Moore, F.J. Brown, S.R. Paratore, R. Ferrante, E.J. Gleazer, Jr. (Visiting), M.A. Burns, G.W. Smith (Chair), J.A. Greenberg, J.D. Fife, M.R. Phelps, D.H. Holmes, L.D. Leonard  
Adjunct Professor R.C. Rist  
Associate Professor D.M. Saunders  
Assistant Professor W.F. Lynch  
Instructor C.B. Stapp

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Master of Education, Master of Arts in Teaching, Education Specialist, and Doctor of Education.

### First Group

- 100 **Special Workshop in Education and Human Development** (arr.) Staff  
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

### Second Group

- 104 **Psychology for Learning and Teaching** (3) Gerhard  
Principles, theory, nature, and course of learning and teaching processes. Exam-



- ination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring) Staff
- 112 **Measurement and Evaluation** (3)  
Basic evaluative measurement techniques: selection, administration, and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring) Staff
- 120 **Experimental Course in Education and Human Development** (arr.)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff
- 125 **Museums as Cultural and Educational Resources** (3)  
Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in art, history, and science museums in the metropolitan area. (Fall and spring) Staff
- 171 **Introduction to Human Development I** (3)  
Lectures and fieldwork. All aspects of development through adolescence; child study techniques. Two to three hours weekly field experience in appropriate setting. (Fall and spring) Staff
- 172 **Introduction to Human Development II** (3)  
Adult development from young adulthood to old age. Dominant psychological, social, and physical competencies; motivational changes; coping styles; maladaptive behavior. Three hours weekly field experience in appropriate agency setting. (Fall and spring) Staff
- 180 **Computer Literacy** (3)  
A hands-on introduction to micro, mini, and mainframe computing system operating environments. Word processing, communications, qualitative analysis, database management, and graphics software. Personal productivity applications are emphasized through demonstrations, guided practice, and a supervised individual project. No previous computer experience required. May be taken for graduate credit. (Fall and spring) Lynch
- 187 **Sign Language and Deafness I** (3)  
Introduction to American Sign Language and to cultural aspects of the deaf community. Staff
- 188 **Sign Language and Deafness II** (3)  
Development of conversational skills in American Sign Language and of cultural awareness of the deaf community. Prerequisite: Educ 187. Staff
- 193-94 **Research and Independent Study** (arr.)  
Individual research under guidance of a staff member. (Academic year) Staff
- 200 **Special Workshop in Education and Human Development** (arr.)  
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. Staff

### Third Group

Departmental prerequisite: A degree from an accredited institution and adequate professional preparation are prerequisite to all third-group courses. With permission of the instructor, undergraduate students in their senior year may enroll in third-group courses.

- 201-2 **International Education** (3-3)  
A study of a selected sample of foreign education systems as they reflect culture, history, values, people, and current changes in the world today. Research techniques to develop a global frame of reference. Foreign resources and resources unique to the Washington area are utilized. (Summer) Moore
- 203-4 **Comparative Education** (3-3)  
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Academic year) Moore and Staff
- 205 **International Experiences** (1 to 6)  
Travel to a foreign country for specific study and research. Admission by permission of the instructor. Staff



- 206 **American Education: Introduction and Overview for International Students** (3) Moore  
The nature and organization of American education in a social, historical, and philosophical context; understanding contemporary change and how it is reflected in the education system.
- 207 **Instructional Materials, Media, and Resources** (3 to 6) Staff  
Review of technological contributions to education. Examination of current and emerging developments. Framework for study of selection, utilization, integration, and evaluation of audiovisual media in the teaching/learning process. (Summer)
- 208 **Human Development** (3) Rashid  
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and summer)
- 209 **Child Development** (3) Rashid  
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)
- 210 **Adolescent Development** (3) Rashid  
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)
- 211 **Computers in the Classroom** (3) Lynch  
Fundamental microcomputer concepts and skills needed to use the computer in the classroom. Introduction of programming languages, general-purpose applications software, and educational software (courseware), together with important educational issues concerning their use in the classroom. Prerequisite: Educ 180. (Spring)
- 212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Staff  
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data-gathering techniques and descriptive statistics. (Fall, spring, and summer)
- 213-14 **Western Educational Thought** (3-3) Boswell  
Following the themes of certainty, equality, and progress, this course examines the ideas of selected philosophers in their historical context and relates them to education. Educ 213: From Sumer to the Enlightenment; Educ 214: From the Enlightenment to the present with concentration on the American experience. (Fall and spring)
- 216 **Advanced Study of the History of Education** (3) Boswell  
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213-14 or the equivalent.
- 217 **Advanced Study of the Philosophy of Education** (3) Boswell  
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213-14 or the equivalent.
- 218 **Social Foundations of Education** (3) Boswell  
The relationship between school and society; social, economic, and political purposes of schooling as well as forces that shape policies and school curricula. Contemporary issues and their implications for the future.
- 220 **Experimental Course in Education and Human Development** (arr.) Staff  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.
- 222 **Museum Studies** (3) Stapp  
Study of the museum's functions and its educational roles. Admission by permission of instructor. (Summer)
- 223 **Museum Audiences** (3) Staff  
Study of diverse audiences of many ages who use and enjoy museums; appropriate museum and outreach practices. Admission by permission of instructor. (Fall)



- 224 **Communication Skills** (3) Staff  
Theory of and practice in the development of communication skills in the museum. Educational concepts; teaching strategies and techniques; institutional liaison and group process. Admission by permission of the instructor. (Summer)
- 226 **Internship and Seminar in Museum Education** (6) Stapp  
Four-day-a-week placement in education departments in area museums supervised by George Washington University faculty. On-campus seminar includes grant proposal writing. Admission by permission of instructor. (Spring)
- 227 **Museum Evaluation** (3) Staff  
Evaluation and research methods appropriate to the museum setting. Review of research on museum audiences; designing program and exhibit evaluations. Admission by permission of instructor. (Summer)
- 228 **Selected Topics in International Education** (3) Moore  
Investigation of historical development of international education; research on selected topics of general importance to the field of international education. Admission by permission of instructor. (Fall)
- 230 **Managing Computer Applications** (3) Ferrante  
For managers and prospective managers in education and human services who are concerned with the automation of their operations. Students will acquire the basic principles needed to design, implement, and manage an information system. Prerequisite: permission of instructor. (Spring and summer)
- 233 **Supervised Experience in Education and Human Development Services** (3 to 6) Staff  
Fieldwork, internship, and instructional practice in higher education (Greenberg) or museum education (Stapp). Admission by permission of instructor. (Fall and spring)
- 240 **Proposal Writing** (3) Ferrante  
The preparation of proposals for educational, business, and industrial applications, including those submitted for funding. Many styles and formats are illustrated. Each student will prepare a proposal in cooperation with an organization or agency. (Fall and summer)
- 242 **Fundamentals of Educational Administration** (3) Brown  
Organization, structure, and governance of public education; federal, state, and local responsibilities. Basic administrative/leadership theory. Roles and functions of school administrators.
- 243 **Human Relations in Educational Management** (3) Saunders  
Principles and practices in human relations for teachers, administrators, other school personnel, parents, and community leaders. Current theoretical and research findings; applications to social change; techniques of working with individuals and groups.
- 246 **Administrative Issues in Education** (3) Saunders  
Administrative strategies and practices appropriate to problems in education
- 248 **Supervision of Instruction** (3) Saunders  
Study of interdisciplinary foundations of supervision. Special attention to the function of theory, change, individual and group relationships in organizations, staff influence processes, talent utilization, and evaluation of programs and staff. (Summer)
- 259 **The Principalship, K-12** (3) Saunders  
A general introduction to the principalship. Administrative tasks and procedures are stressed, together with the principal's role in handling educational issues and problems.
- 260 **Supervision in the Elementary and Secondary School** (3) Saunders  
For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. Prerequisite: Educ 248. (Spring)
- 261 **Practicum in Human Development** (3) Rashid  
Open to human development majors with permission of instructor.



- 262 **Internship in Human Development** (3) Rashid  
Open to human development majors with permission of instructor.
- 267 **Practicum in College Student Development** (3 to 6) Burns  
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)
- 268 **Power, Leadership, and Education** (3) Boswell  
The nature of power, leadership, and education; the relationship of power to leadership; the essential nature of education in the exercise of power and leadership in a democratic setting. (Fall)
- 269-70 **School Business Management** (3-3) Brown  
Educ 269: Philosophy, responsibilities, and functions of school business management. Educ 270: Practicum in school business management. Educ 269 is prerequisite to Educ 270. (Academic year)
- 271 **Policy-Making for Public Education** (3) Boswell, Ferrante  
The nature of educational policy: the role of single-interest groups, the courts, legislative bodies, administrative bureaucracies, and professionals in establishing parameters and allocating resources. Analysis of specific techniques of policy formation. (Summer)
- 272 **Educational Planning** (3) Staff  
An examination of the planning movement in education: its historical development and the recent shift in premises, context, and expectations. Different approaches to the planning process; its relationship to the concepts of systems and futurism; participatory, sectorial, and regional aspects; role of research, and overview of main analytical techniques currently in use. (Fall)
- 273 **Foundations of College Student Development** (3) Burns  
College student development theories, practices, and problems, including historical overview and human development theories related to college students. (Fall)
- 274 **Group and Organizational Theories** (3) Burns  
Focus on theorists, including Argyris, Blau, Miles, Festinger, and Lewin, and practical application of theories to various organizational settings and individuals. Prerequisite: permission of instructor. (Spring)
- 275 **School Finance** (3) Brown  
Issues in financial support of public education. Local, state, and federal roles. Budget development and administration.
- 276 **Public Relations in School Administration** (3) Brown  
The function, purposes, and resources of school public relations. Development of skills in planning public relations programs and activities. Theory and practice of effective communication.
- 277 **Dynamics of Change** (3) Boswell  
An analysis of the process of change, particularly as it relates to educational policy. Comparison of theories; analytical tools; historical precedents; examples of federal educational policies.
- 278 **School Law** (3) Saunders  
Constitutional and statutory provisions for public school education; origin and legal status of the local school unit; nature of the school board; legal status of teachers and administrators; legal rights and responsibilities of parents and pupils. (Spring)
- 279 **Practicum in Supervision** (3 to 6) Brown, Saunders  
Practical experience in supervision of instruction. Admission by permission of instructor. (Fall and spring)
- 280 **Internship: Supervision** (3 to 6) Brown, Saunders  
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)
- 281 **Program Evaluation: Theory and Practice** (3) Holmes  
A general introduction to the theory of evaluation of social programs. Overview of evaluation models, methodology associated with program evaluation, and



- examination of evaluation in the context of political and social environments. (Fall)
- 282 **Administration of College Student Development Services and Programs** (3) Burns  
An overview of student affairs administrative practices, including needs assessment, planning models, budgeting, policy development, program development, facility management, evaluation, and team building. Admission by permission of instructor. (Fall)
- 283 **Higher Education in the United States** (3) Burns, Greenberg  
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)
- 284 **Administration of Higher Education** (3) Burns, Ferrante, Fife  
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)
- 285 **Education and National Development** (3) Boswell  
Examination of the basic assumption that education contributes to national development. In addition to economic growth and civic identity, what constitutes national development in advanced industrial societies and societies moving to industrialism? What role does education play in promoting this process? (Fall)
- 286 **Interpretation in the Historic House Museum** (3) Stapp  
Same as AmCv 286. Seminar integrating advanced practices of museum education with current scholarship in architectural history, material culture, social history, and women's studies. Extensive use of Washington museum resources. Open to undergraduate and graduate students. (Fall)
- 291 **Educational Facilities Planning** (3) Brown  
Principles of school plant planning; site selection; evaluation of existing buildings; adaptation to curricular needs; building operation and maintenance; disposition of surplus facilities; energy and accessibility considerations.
- 292 **Practicum in Program Evaluation** (3 to 6) Holmes  
Supervised practical experience in field placements. Admission by permission of instructor. (Fall and spring)
- 293-94 **Research and Independent Study** (1 to 3) Staff  
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)
- 295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith, Holmes  
Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)
- 297 **Personnel Administration** (3) Brown  
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions; current issues.
- 299-300 **Thesis Research** (3-3) Staff (Fall)  
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. and spring)

#### Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates and to other post-master's degree students with approval of instructor. Study is individually planned on the basis of competence and to meet identified professional needs or field requirements.

#### 301 **Advanced Study: Ideas, Issues, and Practices in Education** (3)

For precandidates for the Ed.D. Alternative means of responding to the complexities of the educational process. Topics vary but concern education as an individual process and as sociocultural preservation and renewal.



- 302 **Quantitative Methods III: Inferential Techniques** (3) Holmes, Paratore, Smith  
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)
- 303 **Data Analysis** (3 to 6) Staff  
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)
- 306 **Quantitative Methods IV: Advanced Research Design** (3) Holmes, Paratore, Smith  
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)
- 307 **Qualitative Research Methods** (3) Holmes and Staff  
A general introduction to qualitative research procedures in social science research. Application of qualitative methods, design, analysis. (Fall)
- 329 **Seminar in Program Evaluation** (3) Holmes  
Contemporary problems and issues in evaluation of social programs: design, implementation, analysis, and utilization. (Spring)
- 334 **Doctoral Internship in Educational Policy** (3 to 6) Holmes  
Supervised internship in education or human services settings for advanced doctoral students.
- 340 **Methods of Policy Analysis in Education** (3) Holmes, Staff  
Modes of analysis employed in the study of educational policy issues. Alternative methods of analysis for policy formation, implementation, and impact assessment. Both theoretical and case study materials are used. Prerequisite: Educ 295. (Fall and spring)
- 341 **Cognitive Models and Instruction** (3) Rashid  
Cognitive models (Guilford, Bruner, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)
- 342 **Language Development** (3) Rashid  
Nature of language acquisition and development; emphasis on sociolinguistics and psycholinguistics most pertinent to education. (Spring)
- 343 **Advanced Studies in Human Development** (3) Rashid  
Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation, and research needs in respect to each topic discussed. Admission by permission of instructor. (Spring)
- 344 **Adult Development and Aging** (3) Rashid  
Theories and research on personality and cognition in adulthood and old age. Emphasis on evaluating research designs and methods and deriving implications of findings for gerontological programs and selected professional roles. (Spring)
- 345 **Advanced Studies in Educational Policy Analysis** (arr.) Holmes  
352 **Seminar: Western Educational Thought** (arr.) Boswell
- 353 **Seminar: Higher Education Administration** (arr.) Greenberg, Ferrante, Gleazer
- 354 **Seminar: Administration and Supervision** (arr.) Brown, Saunders
- 355 **Seminar: Applied Educational Administration** (3 to 6) Brown, Saunders  
Application of the theories and principles of administration to public and private schools. Field experience in a phase of administration and supervision. Admission by permission of instructor. (Fall and spring)
- 356 **Seminar: Human Development** (arr.) Rashid
- 372 **Internship in Higher Education** (3 to 6) Greenberg and Staff  
Supervised experiences in selected areas in college teaching. Admission by permission of instructor. (Spring)
- 373 **The Community/Junior College** (3) Greenberg, Gleazer  
The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)



- 374 **Current Issues in Higher Education** (3) Ferrante  
Prerequisite: Educ 283, 284. (Spring) Staff
- 378 **Financing Higher Education** (3) Staff  
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Spring) Greenberg, Ferrante
- 379 **Administration and Governance of Two-Year Colleges** (3) Greenberg, Ferrante  
A study of the community/junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as the theory and structure of two-year college organization. (Fall and spring) Fife
- 380 **Legal Problems in Higher Education** (3) Fife  
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring) Fife
- 381 **College and University Curriculum** (3) Fife  
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Fall) Greenberg
- 382 **Teaching Strategies for Adult Learners** (3) Greenberg  
Designing, implementing, and evaluating instructional strategies for adult learners. Assessing needs, writing objectives, selecting curriculum/content, selecting and implementing methods and techniques, selecting appropriate mediating devices, and evaluating instruction. (Spring) Ferrante
- 384 **College and University Governance** (3) Ferrante  
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall) Ferrante, Fife, Greenberg
- 385 **Problems and Practices in Educational Administrative Organization** (3 to 6) Ferrante, Fife, Greenberg  
Application of principles and practices concerned with change and evaluation of educational administration. Greenberg
- 386 **Internship: Higher Education Administration** (3 to 6) Greenberg  
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring) Brown, Saunders
- 387 **Internship: Administration** (3 to 6) Brown, Saunders  
Service in an educational institution or education-related program directed by the University's faculty. (Fall and spring) Ferrante
- 388 **Case Studies in Higher Education Administration** (3) Ferrante  
An analysis of case studies related to administrative functions in colleges and universities. Staff
- 390 **Pre-Dissertation Seminar** (3 to 6) Staff  
Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor. Staff
- 391 **Dissertation Research** (arr.) Staff  
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390.

## ENGLISH

Professors P.H. Highfill, Jr., R.N. Ganz, Jr., J.H. Maddox, A.E. Claeysens, Jr., G. Paster, J.A.A. Plotz, J.A. Quitslund, C.W. Sten (Chair)  
Associate Professors R.C. Rutledge, G.R. Bozzini, R.L. Combs, D. McAlevey, O.A. Seavey, G. Carter  
Associate Professorial Lecturers E.R. Garner, T.G. Wallace  
Assistant Professors A. Romines, M.V. Dow, M.S. Soltan, K. Moreland, J.L. Porter, C. Sponsler, G.B. Leighton (Visiting), F. Moskowitz (Visiting)  
Assistant Professorial Lecturers E.T. McClay, K.L. Levenback, A. Nissen, S. Willens, S. Haedicke



Lecturers D. Scarboro, D. Carter, N. Whichard, J. Bolz, D.A. Bruno, J.C. Carlberg, C.E. Gamber

Jenny McKean Moore Writer in Washington B.J. Nelson

*Bachelor of Arts with a major in American literature or English literature (field-of-study) or American literature, English literature, or literature in English (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Engl 51-52 or 61-62 or 71-72. (Engl 51-52 is recommended for American literature majors.)

3. Required courses in related areas—(a) 12 semester hours of college-level foreign language study (Greek, Latin, Hebrew, French, German, Italian, Russian, or Spanish) or the equivalent, verified by a transcript or an examination administered by the appropriate department; (b) 6 semester hours of philosophy and/or religion; (c) 6 semester hours of history (English, American, European, or world). Courses in American history are recommended for American literature majors.

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199-200, and in English Literature, Engl 195-96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—Engl 120 and 27 semester hours of second-group courses, of which no more than 6 hours may be taken in creative writing or composition. The 27 hours of second-group courses are as follows for the concentrations within the departmental major:

*American literature*—Engl 160; either Engl 161-62 or 163 and 167; 3 hours in English literature; and 15 additional hours of courses in the department, of which at least 9 must be in American literature.

*English literature*—Engl 194; Engl 112, 128, or 130; 3 hours in American literature; and 18 additional hours of courses in the department, of which at least 12 must be in English literature.

*Literature in English*—One course from each of the following categories:

1. Major authors: Chaucer, Shakespeare, Milton (Engl 112, 127, 128, or 130).
2. British and American literature before 1800 (Engl 112, 113, 125, 129, 130, 131, 132, 153, 155, or 160).
3. 19th-century British and American literature (Engl 133, 134, 135, 136, 154, 161, 162, 163, 167).
4. 20th-century British and American literature (Engl 137, 138, 139, 157, 158, 164, 165, 166, 168, 177, or 178).

With departmental approval, courses with appropriate subject matter may be taken in place of those specified above. Students take 15 additional hours of second-group courses, of which 6 may be earned by studying literature in a foreign language.

*Minor in literature in English*—15 hours of second-group literature courses, chosen in consultation with an advisor in the department.

*Minor in creative writing*—Engl 81 and 12 hours of second-group courses offered by the department, of which at least 9 must be in creative writing.

*Master of Arts in the field of American literature or Master of Arts in the field of English literature*—Prerequisite: a Bachelor of Arts degree with an undergraduate major in English or American literature, or 24 semester hours in English or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) 24 semester hours of course work planned in consultation with the department advisor; (2) Level One proficiency (translation of a passage with a dictionary)



in an approved foreign language (French, German, Italian, Spanish, Greek, or Latin); (3) a Master's Comprehensive Examination in American or English literature; and (4) either a master's thesis (6 semester hours) on an approved topic, directed by a member of the department's graduate faculty, or, with the approval of the department's director of graduate studies, 12 additional semester hours of course work in lieu of the thesis. Students must maintain a quality-point index of at least 3.25.

*Doctor of Philosophy in the field of American literature or Doctor of Philosophy in the field of English literature*—Prerequisite: a Bachelor of Arts degree with an undergraduate major in English or American literature, or 24 semester hours in English or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including satisfactory completion of (1) 72 semester hours of course work (48 for students with M.A. degrees in English) planned in consultation with the department advisor; (2) Level Two proficiency (translation of a passage without a dictionary) in an approved foreign language, or Level One proficiency (translation with a dictionary) in two approved foreign languages (French, German, Italian, Spanish, Greek, or Latin); (3) a qualifying examination in American Literature or English literature (to be taken as soon as feasible within the student's first 24 hours of course work), a period examination, a genre examination, and an examination on an approved major author or an alternative field; (4) a dissertation on an approved topic, directed by a member of the department's graduate faculty and approved by an examining committee.

Each student plans a program of studies in consultation with the department advisor and a committee of the graduate faculty. Students must maintain a quality-point index of at least 3.25. The fields for the period examination are English Medieval: beginnings to 1500; English Renaissance: 1500–1660; English 18th Century: 1660–1800; Early American: beginnings to 1815; 19th-Century English and/or American: 1800–1900; and 20th-Century English and/or American: 1900 to the present. The fields for the genre examination are drama, prose fiction, poetry, and criticism.

**Departmental prerequisite:** Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 160, 161, and 162.

Scores on the College Board English Composition Achievement Test, the Test of Standard Written English, or the English component of the American College Testing battery determine placement in Engl 9 or 10 and eligibility to waive the requirement, according to the following schedule:

Achievement Test		TSWE		ACT	Placement
650 and above	or	58 and above	or	28 and above	Waives Engl 10
500–649	or	40–57	or	20–27	Engl 10
499 and below	or	39 and below	or	19 and below	Engl 9

The admission of international students to any English course is determined by the EFL Placement Test. Students should apply to the office of English for International Students to take this test (see Students from Foreign Institutions, under Admissions).

## EXPOSITORY WRITING

### First Group

- 9 English Composition: Language as Communication (3)** Bozzini and Staff  
Includes content of Engl 10; offers the advantage of more intensive work on analytical reading and on fluency and control in the writing process. Class meets five hours per week. Special fee, \$25. (Fall and spring)



- 10 **English Composition: Language as Communication** (3) Bozzini and Staff  
Critical examination of what language can do and what student writers can do with language; analysis of various kinds of discourse, focusing on their pragmatic and psychological dimensions. (Fall and spring)
- 11 **English Composition: Language and the Arts and Sciences** (3) Bozzini and Staff  
Study and practice of expository and argumentative techniques; emphasis on the sentence and diction and on logical thought by analysis of selected readings on the nature of language and the arts and sciences. Practice in effective, accurate, and honest use of secondary sources in a library research paper or a documented essay. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12 or 13. (Fall and spring)
- 12 **English Composition: Language in Literature** (3) Bozzini and Staff  
Study and practice of expository and argumentative techniques through critical writing; emphasis on stylistics in the sentence and diction by the study of literary genres and of the use of language in literature. Practice in effective, accurate, and honest use of secondary sources in a library research paper or a documented essay. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11 or 13. (Fall and spring)
- 13 **English Composition: Language and Ideas** (3) Staff  
Study and practice of expository and argumentative techniques; emphasis on the rhetorical problems raised by various intellectual disciplines and historical milieus. A substantial research paper is required. Prerequisite: Engl 9 or 10. To be taken only in conjunction with Hmn 1. Students who receive credit for Engl 13 cannot receive credit for Engl 11 or 12. (Fall and spring)
- 20 **The Writing of Reports** (3) Staff  
Theory and practice in the writing of technical reports. Prerequisite: Engl 11. Offered off campus only.

## Second Group

- 101 **Advanced Writing** (3) Staff  
Individualized instruction and frequent conferences; writing projects vary with each student according to needs and interests. Emphasis on developing professional work habits. Prerequisite: Engl 11, 12, or 13, or written permission of instructor. Class size limited to 15 students. (Fall and spring)
- 102 **Written Communications in Accounting** (3) Bozzini and Staff  
(Formerly Engl 100)  
Analysis of communications by accountants and managers; frequent writing assignments, with emphasis on effective form and language in memoranda, letters, reports. Major in accountancy not required. Prerequisite: Engl 11 and junior status. Class size limited to 15 students. (Fall and spring)
- 109 **Expository Writing for the Professions** (3) Staff  
Weekly exercises based on students' individual needs; particular attention given to problems in writing for technically sophisticated readers. Selected readings. Offered off campus only.
- 110 **Writing in Engineering and the Sciences** (3) Staff  
Study of writings by engineers and scientists who have considered the implications of technology in the modern world. Concurrently, study and practice of the communication skills needed for careers in engineering and the sciences. Prerequisite: Engl 9 or 10 or EFL 50; junior, senior, or graduate status. Material fee, \$5. (Spring)
- 111 **Preparation for Peer Tutors in Writing** (3) Moreland  
For undergraduates accepted as tutors in the Writing Center: study and practice of techniques for prewriting, writing, and revision; readings on collaborative learning, the composing process, composition theory, critical thinking, and the teaching of writing; observation and exercise in writing, peer criticism, and tutoring. (Fall)



## Third Group

## 201 Theories of Rhetoric and the Teaching of Writing (3)

Porter

Brief historical account of the development of Western rhetoric; readings in current theories of the teaching of writing and in related fields of linguistics, philosophy, and cognitive psychology; exploration of the writing process, writing across the curriculum, and use of computers in writing and teaching; supervised experience in the classroom and Writing Laboratory; weekly writing assignments. Open to qualified seniors. (Fall)

## CREATIVE WRITING

With the exception of Engl 181, creative writing courses may not be repeated for credit.

## First Group

## 81 Introduction to Creative Writing (3)

McAleavey and Staff

An exploration of genres of creative writing (fiction, poetry, and/or playwriting). Basic problems and techniques; examples of modern approaches; weekly writing assignments; workshop and/or conference discussion of student writing. Prerequisite: Completion of English composition requirement. Limited to 18 students. Material fee, \$5. (Fall and spring)

## Second Group

## 103 Intermediate Fiction I (3)

Moskowitz and Staff

The writing of fiction. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51-52 or equivalent). Limited to 15 students. Material fee, \$5. (Fall)

## 104 Intermediate Poetry I (3)

McAleavey and Staff

The writing of poetry. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51-52 or equivalent). Limited to 15 students. Material fee, \$5. (Fall)

## 105 Intermediate Playwriting I (3)

Claeyssens

Same as TrDa 105. The writing of plays. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51-52 or equivalent). Limited to 15 students. (Fall)

## 106 Intermediate Fiction II (3)

Claeyssens, Moskowitz

The writing of fiction. Prerequisite: Engl 103 or equivalent. Limited to 15 students. Material fee, \$5. (Spring)

## 107 Intermediate Poetry II (3)

McAleavey and Staff

The writing of poetry. Prerequisite: Engl 104 or equivalent. Limited to 15 students. Material fee, \$5. (Spring)

## 108 Intermediate Playwriting II (3)

Claeyssens

Same as TrDa 108. The writing of plays. Prerequisite: Engl 105 or equivalent. Limited to 15 students. (Spring)

## 181 Creative Writing Workshop (3)

TBA

Taught by the Jenny McKean Moore Writer in Washington; open to undergraduates and graduate students. Prerequisite: Engl 81 or equivalent; consent of instructor. Writing sample to be submitted before registration. May be repeated for credit, if taught by a different instructor. Limited to 18 students. Material fee, \$5. (Fall)

## ENGLISH AND AMERICAN LITERATURE

## First Group

## 51-52 Introduction to English Literature (3-3)

Quitslund and Staff

Representative works by major authors studied in their historical context; discussion of recurrent themes and introduction to various types and forms of imaginative literature.



tive literature. Engl 51: Middle Ages through the 18th century. Engl 52: 19th and 20th centuries. (Academic year)

61 **Tragedy** (3) Carter, Paster  
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett.

62 **Comedy** (3) Carter, Rutledge  
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges.

71-72 **Introduction to American Literature** (3-3) Ganz and Staff  
Historical survey. Engl 71: From early American writing through Melville, Whitman, and Dickinson. Engl 72: From Twain, James, and Crane to the present. (Academic year)

## Second Group

112 **Chaucer** (3) Sponsler  
(Fall)

113 **Medieval English Literature—Exclusive of Chaucer** (3) Sponsler

115 **History of the English Language** (3) Staff  
Development of the English language in a historical treatment of English grammar.

120 **Critical Methods** (3) Paster, Plotz, Romines  
The topics and techniques of literary analysis, applied to English and American poetry, prose fiction, and drama. Attention to prosody, stylistic and structural analysis, narratology, and critical theory applied to specific literary texts.

123 **Approaches to Interpretation of Literary Texts** (3) Carter, Soltan  
Historical study of poetics and interpretation, from the classical tradition (Aristotle, Sidney, Johnson) and Romanticism (Wordsworth, Coleridge, Shelley) to the modern era (Arnold, Eliot, Ortega y Gasset) and some contemporary critics (e.g., Bloom, Derrida).

125 **Elizabethan Verse and Prose** (3) Quitslund  
Major authors from the late 16th century (e.g., Sidney, Spenser, Hooker, Nashe, Shakespeare, Donne), seen in relation to Continental Renaissance culture. (Spring)

127-28 **Shakespeare** (3-3) Highfill  
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Early 17th Century** (3) Quitslund  
Poetry and prose to 1660, exclusive of Milton. (Fall)

130 **Milton** (3) Paster  
Study of the major works in verse and prose, following the course of Milton's career. (Spring)

131-32 **English Literature, 1660-1800** (3-3) Highfill  
Poetry and prose of major Baroque, Neoclassic, and early Romantic writers, examined in a context of social history and, occasionally, other arts. Content varies but always centers on major figures. Engl 131: Dryden, Swift, Pope, Thomson. Engl 132: Dr. Johnson and his circle, Gray, Cowper, Burns. (Academic year)

133-34 **The Romantic Movement** (3-3) Combs, Plotz  
Major figures and topics in English and Continental romanticism. Engl 133: Blake, Wordsworth, Coleridge, Lamb, and others. Engl 134: Byron, Shelley, Keats, Hazlitt, DeQuincey, and others. (Engl 133—fall)

135-36 **Victorian Literature** (3-3) Carter  
Engl 135: 1830-1865—E. Brontë, Dickens; Tennyson, Browning, Arnold; Darwin, Carlyle, Ruskin. Engl 136: 1865-1900—Eliot, Hardy, Conrad; Swinburne, the Rossettis, Morris; Pater, Wilde, the Nineties. (Engl 135—fall)

137-38 **The 20th Century** (3-3) Maddox, Soltan  
Engl 137: Emergence of modernism in poetry, fiction, and criticism. Engl 138: Literature since the 1930s. (Engl 137—fall)



- 139 **20th-Century Irish Literature** (3) Maddox  
The achievements of Irish writers between 1890 and 1939, with emphasis on Yeats and Joyce.
- 145 **Special Topics in English Literature** (3) Staff  
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.
- 146 **Special Topics in Literature** (3) Staff  
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.
- 153-54 **The English Novel** (3-3) Maddox, Soltan  
Major novelists. Engl 153: 18th century. Engl 154: 19th century.
- 155-56 **The English Drama** (3-3) Paster, Highfill  
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present. (Engl 155—fall)
- 157 **20th-Century Drama** (3) Paster  
Representative continental, English, and American plays of the 20th century.
- 160 **Early American Literature and Culture** (3) Seavey  
The shaping of America's early literary and cultural traditions as shown by major writers of the Colonial and Early National periods: Bradstreet, Cotton Mather, Edwards, Franklin, Crèvecoeur, and others. (Fall)
- 161 **American Romanticism** (3) Sten  
The shaping of America's literary and cultural traditions as shown by major writers of the Romantic period: Poe, Emerson, Hawthorne, Melville, Thoreau, Whitman, Dickinson, and others. (Spring)
- 162 **American Realism** (3) Romines  
The shaping of America's literary and cultural traditions as shown by major writers of the Realist period: Twain, James, Crane, Howells, Wharton, Chopin, Robinson, and others. (Fall)
- 163-64 **American Poetry** (3-3) Ganz, Combs, McAleavey  
Close examination of major American poems. Engl 163: From the beginnings through the early 20th century: works by Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Robinson, Frost, and others. Engl 164: The 20th-century modernist poets: Stevens, Pound, Williams, Eliot, Ransom, Cummings, Crane, and others. (Academic year)
- 165-66 **American Drama** (3-3) Combs, Claeysens  
Historical and critical study of significant plays and forms. Engl 165: The life and works of Eugene O'Neill and the dramatic techniques of Ibsen, Chekhov, and Strindberg that helped to shape 20th-century American drama; biographical and critical readings included. Engl 166: Significant and representative works of American theater, 1935-1982, including plays by Clifford Odets, Lillian Hellman, William Saroyan, Thornton Wilder, Arthur Miller, William Inge, Tennessee Williams, Eugene O'Neill, Carson McCullers, and Lorraine Hansberry, and outstanding examples of musical comedy. (Academic year)
- 167-68 **The American Novel** (3-3) Maddox, Seavey, Moreland  
Historical and critical study of major works in the American novelistic tradition. Engl 167: From beginnings through the 19th century: Hawthorne, Melville, James, Twain, Dreiser, and others. Engl 168: The 20th century: Wharton, Cather, Anderson, Hemingway, Fitzgerald, Faulkner, Wright, R.P. Warren, Nabokov, and others. (Academic year)
- 170 **The Short Story** (3) Combs  
An extensive survey of short fiction by a wide variety of writers of the 19th and 20th centuries, about half of them American; readings on the art of the short story by writers and literary critics included. (Spring)
- 171 **Major Authors of Literature in English** (3) Staff  
In-depth studies of two or three authors (of British, American, or other nationality) who have written in English. Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.



- 172 **Studies in Literary Movements** (3) Staff  
Varying topics that concern the related achievements of a group of authors. Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.
- 174 **Afro-American Literature** (3) Staff  
Same as AmCv 174. Study of texts representing the experiences of black Americans and the ideas and social forces that have shaped their lives and writings.
- 175 **Special Topics in American Literature** (3) Staff  
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.
- 177-78 **Contemporary American Literature** (3-3) Ganz, Claeysens  
Major and representative works, 1946-1980. Engl 177: poetry, fiction, and non-fiction by Flannery O'Connor, Ginsberg, Kerouac, Rich, Lowell, Plath, Mailer, Roethke, Baraka, Berryman, Ashbery, and others. Engl 178: essay, short story, and novel: Robert Penn Warren, J.D. Salinger, James Agee, E.B. White, Cheever, Nabokov, Welty, Wilder, Tillie Olsen, Bellow, John McPhee, and others. (Academic year)
- 182 **A Writer's Perspective on Literature** (3)  
Study of a literary topic, from the point of view of the Jenny McKean Moore Writer in Washington. May be repeated for credit. (Spring)
- 183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy  
Same as Fren/Ger/Hist/Rel 183 and Art 187.
- 194 **History of English Literature** (3) Staff  
A historical survey of the processes by which literature was produced in the British Isles from Old English beginnings up to 1800. (Spring)
- 195-96 **Proseminar in English Literature** (3-3) Carter  
For field-of-study majors in English literature. Themes and concerns basic to the English literary tradition that draw connections between diverse works from the Old English period to recent times. (Academic year)
- 197 **Independent Study** (3) Sten and Staff  
For exceptional students whose academic objectives are not accommodated in regular courses. Students must obtain the chair's approval and arrange for supervision by an appropriate member of the department. (Fall and spring)
- 198 **Senior Honors Thesis** (3) Ganz and Staff  
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)
- 199-200 **Proseminar in American Literature** (3-3) Staff  
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

### Third Group

- 212 **Studies in Chaucer** (3) Sponsler
- 219 **Introduction to Graduate Studies in English** (3) Quitslund, Sten  
For all candidates for M.A. and Ph.D. degrees in American or English literature. Introduction to the scope and methods of advanced literary studies; readings, research problems, and instruction designed to acquaint students with available aids to research. (Fall)
- 223 **Contemporary Literary Theory** (3) Carter, Soltan  
Inquiry into the nature of literary texts and interpretive strategies. Close readings of texts (by Barthes, Derrida, de Man, Bloom, Eagleton, Fish, Kermode, and others) exemplifying the ferment of recent theoretical writing about literature. (Fall)
- 226 **Studies in Renaissance Verse and Prose** (3) Quitslund, Paster  
Investigation of broad topics central to literature of the Renaissance (e.g., development of the lyric, heroic poetry and romance, literature and the court), with



- primary attention to English texts and some attention to classical and continental contexts.
- 227-28 **Studies in Shakespeare and his Contemporaries** (3-3) Paster  
Specialized studies of Elizabethan and Jacobean drama, considered in its cultural context, with emphasis on Shakespeare.
- 230 **Studies in Milton** (3) Staff  
(Fall)
- 232 **Studies in English Literature, 1660-1780** (3) Highfill  
Plotz
- 233-34 **Studies in the Romantic Movement** (3-3)  
Intensive and contextual consideration of English Romantic writers, themes, genres. Topics will vary: e.g., Byron and Romantic irony, Wordsworth and Keats, defining Romanticism, Romanticism and childhood.
- 235 **Studies in Victorian Poetry** (3) Carter  
Investigation of various ways in which the major Victorian poets depended upon and departed from the achievements of precursors among the Romantics and earlier poets.
- 236 **Studies in Victorian Prose** (3) Carter  
Study of seminal writings by such authors as Carlyle, Mill, Arnold, Newman, Darwin, and Pater, with attention to both their intrinsic merit and the light they throw on Victorian poetry and fiction.
- 237-38 **Studies in 20th-Century Literature** (3-3) Soltan  
(Engl 238—fall)
- 253-54 **Seminar: The English Novel** (3-3) Maddox, Soltan  
Investigation of various topics concerning the development of the genre, 18th to 20th centuries: e.g., themes and form in 18th-century fiction; emergence of circumstantial realism; mentors and lovers in 19th-century novels; the revolution in fictional forms circa 1900.
- 263-64 **Seminar: American Poetry** (3-3) Ganz, McAleavey  
American poets and critics of poetry.
- 267-68 **Seminar: American Fiction** (3-3) Sten, Maddox  
Investigation of various topics pertinent to the American novel and short fiction, primarily of the 20th century (e.g., Faulkner, experimental fiction, writers of the Midwest).
- 282 **Seminar: Early American Literature** (3) Seavey  
(Spring)
- 283-84 **Seminar: American Romanticism** (3-3) Sten  
Engl 283: American Romance writers: Melville, Hawthorne, Poe, and others. Engl 284: American Transcendentalist poetry: Emerson, Whitman, Dickinson, and others.
- 285-86 **Seminar: American Realism, 1865-1915** (3-3) Romines, Sten  
Realistic fiction in various contexts—literary, intellectual, cultural. Major authors, such as James, Twain, Howells, and Wharton, are included, along with other writers, such as Jewett, Chopin, Norris, and Adams. Topics vary: e.g., the autobiographical impulse, influence of French fiction and criticism, the importance of "place," the significance of gender.
- 287 **O'Neill and Modern American Drama** (3) Combs  
Study of the career of Eugene O'Neill and his impact on the development of modern theater in America; readings in biography and criticism. (Fall)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

#### Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301-14. Students wishing to register for these courses should consult the chair of the English Department.



- 301-14 **Folger Institute Seminars** (3 each) Staff  
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

### ENGLISH AS A FOREIGN LANGUAGE

Associate Professor G.R. Bozzini  
Assistant Professors F.C. Reid, S.M. Wright (*Director*), E. Echeverria, M. Kirkland, C. Meloni, S. Thompson, A.J.B. Covarrubias, J.K. Donaldson, Jr.  
Instructors P. Connerton, M.E. Evans, C.L. Iacobelli, M.A.P. Saunders, M.B. Bandas, P.N. Edmondson, C. Stryker (*Visiting*), S. Grant (*Visiting*)

This comprehensive program in English as a foreign language is designed for persons enrolled or planning to enroll in University credit programs, for members of Washington's international community, and for other individuals who wish to improve their command of English through an intensive or semi-intensive study program. International students entering the program must take the EFL Placement Test before registering for any EFL course. English for International Students offers several noncredit special courses in addition to those listed below. For further information, contact Shirley M. Wright, Program Director, English for International Students, George Washington University, Academic Center T-604, Washington, D.C. 20052.

**Note:** In special cases and with the approval of the English for International Students program, component parts of EFL 15, 20, 30, and 40 can be taken separately. Tuition rates and laboratory fees are charged accordingly.

#### First Group

- 15 **Intensive Basic English** (0) Covarrubias, Echeverria  
Introduction to basic grammar, vocabulary, and composition. Development of reading, speaking, and listening skills. Twenty class hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, \$70.
- 20 **Intensive Lower-Intermediate English** (0) Evans, Iacobelli  
Continued study of basic grammar. Continued practice in speaking, listening, reading, vocabulary, and composition. Emphasis on integration of skills. Twenty class hours per week. Students registered in EFL 20 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, \$70.
- 30 **Intensive Intermediate English** (0) Connerton, Grant  
Continued study of grammar with emphasis on complex structures. Further practice in reading, vocabulary, oral communication, and composition. Introduction to academic lectures and note-taking practice. Twenty class hours per week. Students registered in EFL 30 will not be permitted to take additional academic work without approval of the advisor. Tuition is charged at the rate of seven semester hours; laboratory fee, \$35.
- 40 **Intensive Higher-Intermediate English** (0) Bandas, Evans, Kirkland, Meloni, Saunders  
Emphasis on skills needed in academic course work. Continued practice in complex grammar, oral communication, vocabulary, note-taking skills, and composition. Practice in reading strategies for unadapted material. Introduction to basic research techniques. Twenty class hours per week. Students registered in EFL 40 will not be permitted to take additional academic work without approval



- of the advisor. Sections are offered with general academic and technical emphasis. Tuition is charged at the rate of seven semester hours; laboratory fee, \$35.
- 45 **Semi-Intensive Advanced English (0)** Edmondson, Stryker  
Emphasis on skills needed in academic course work. Selective review of grammar. Practice in reading university-level materials, speaking, and study skills. Continued practice in composition and research techniques. Eight class hours per week. Additional class sessions are offered in specialized topics. Tuition is charged at the rate of five semester hours.
- 50 **English Composition/Research Methods for International Students (3)** Donaldson, Meloni  
Composition and library research methods course for students who demonstrate high proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Sections are offered with general academic and technical emphasis. Special fee, \$25.
- 60 **Advanced Oral Communication (3)** Echeverria  
For students who demonstrate high proficiency in English and wish to improve their formal speaking and listening skills in such areas as interviewing, preparing and delivering informative and persuasive speeches, leading and participating in small-group discussions, and taking stands on controversial issues. Instructional resources include professional speeches and topics from recent newspaper and magazine articles and interviews. Four class hours per week. Special fee, \$25.
- 61 **American Language and Culture (3)** Echeverria, Covarrubias  
For students who demonstrate high proficiency in English. Advanced English language skills taught through a study of currents in American thought, culture, and civilization. Discussions are based on selected texts and periodical literature. Topics are highlighted by films, guest lecturers, and cultural activities. Four class hours per week. Special fee, \$25.

### ENVIRONMENTAL AND RESOURCE POLICY—GRADUATE PROGRAM

#### Committee on Environmental and Resource Policy

H. Merchant (Academic Director), J. Millar, T. Vandermer, A. Viterito

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in environmental and resource policy. The program is directed by the Committee on Environmental and Resource Policy and draws upon faculty and relevant courses from the various departments within the University.

The Environmental and Resource Policy Program presents in its core requirement a graduate-level examination of the specific areas that affect decisions made in the broad area of environmental and resource policy. This material includes the analytic tools required for decisions leading to effective policy regarding the environment and natural resources. In addition to mastering the core material, a student is also expected to develop specific competence in an area of particular interest by choosing an approved elective field. Prospective candidates should consult with the director of the Environmental and Resource Policy Program.

**Master of Arts in the field of public policy with a concentration in environmental and resource policy**—Prerequisite: a bachelor's degree with a B average (or equivalent) in a social science, natural science, or other relevant area from an accredited college or university and an introductory course in statistics. Presentation of Graduate Record Examination scores is strongly recommended.

#### Required:

- (a) The general requirements stated under the Graduate School of Arts and Sciences.
- (b) Twenty-six hours of core courses selected from the following (students whose backgrounds include some of these courses may substitute additional courses in the elective field): BiSc 208, 243; Econ 217, 237; EnHe 240; E&RP 210; PSc 203; Psyc 244; Stat 183 (or other appropriate statistical techniques course).



(c) Twelve hours of courses selected from those listed in one of the following elective fields. (Students are required to meet departmental prerequisites before enrolling in courses; check the conditions stated under the Graduate School of Arts and Sciences for receiving graduate credit for advanced undergraduate courses.)

Earth Sciences: Geog 107, 108, 136, 137, 219; Geol 105, 122, 128, 131, 175

Ecology: BiSc 140, 141, 142, 143, 144, 150, 167, 206, 242; Geog 290

Energy: Econ 235; EAd 221 (Environmental Management); Geog 134; PSc 222, 223, 252, 288, 289 (the School of Engineering and Applied Science offers many courses relevant to this area; some may be included in this program)

Resource Management: Econ 161, 162; Geog 132, 133, 222, 230, 290; Soc 127

(d) Comprehensive Project—Taken at the completion of the student's program, the comprehensive project is the investigation of a specific problem in environmental and resource policy and the development of a proposed solution in a manner that integrates the core curriculum with the course work in the elective field.

**210 Seminar in Environmental and Resource Policy (3)**

Staff

Limited to candidates in the Environmental and Resource Policy program; capstone course integrating the core and elective areas of the program. Provides practical experience in decision making and serves as preparation for the comprehensive project.

## ENVIRONMENTAL SCIENCE—GRADUATE PROGRAM

**Academic Committee:** H. Merchant (Director), J. Millar, T. Vandermer, A. Viterito

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of environmental science. The curriculum is designed to provide an understanding of the environment with an emphasis on problems of the work place.

**Master of Science in the field of environmental science**—Prerequisite: a bachelor's degree with a B average from an accredited college or University and an introductory course in statistics.

**Required:** the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Chem 205; Econ 217, 237; EnHe 201, 240, 256, 270, 301; PSc 224; Stat 127. An additional 6 credits are selected in consultation with the advisor. Each student must pass a Master's Comprehensive Examination.

## ENVIRONMENTAL HEALTH

**201 Introduction to Epidemiology (3)**

Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

**240 Environmental Impact Statement Procedures and Environmental Law (3)**

The rationale for environmental impact statements from the viewpoint of the nature and origins of environmental concerns. Government agencies responsible for environmental impact statements; current statutes and regulations pertaining to the environment.

**256 Introduction to Environmental Health (3)**

Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

**270 Industrial Hygiene (3)**

Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high- and low-temperature biological effects, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.



**301 Applied Epidemiology and Environmental Health (3)**

Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

**ENVIRONMENTAL STUDIES****Committee on Environmental Studies**

H. Merchant (Chair), W.C. Parke, W.E. Schmidt, A. Viterito, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. By emphasizing the social sciences, the program leading to the degree of Bachelor of Arts is designed to serve the student whose participation in the environmental decision-making process involves integrating information of a less technical nature. The program leading to the degree of Bachelor of Science prepares a student for a role in environmental decision making that involves the interpretation and use of technical information.

*Bachelor of Arts with a major in environmental studies (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
  - (a) Statistics—Stat 91.
  - (b) Natural sciences—6–8 semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2; or Phys 1, 2, 5, 6. BiSc 3–4 must be passed with a grade of A or B to be accepted toward fulfilling the introductory natural science requirement.
  - (c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; or Soc 1, 2.
3. Required courses for the major (51 semester hours):
  - (a) BiSc 140; Econ 136; Geog 132.
  - (b) Eight semester hours selected from BiSc 101, 102, 103, 105, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 150, 166, 167, 168, 169, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 122, 125, 128, 141, 163; Phys 14, 15, 16, 127–28.
  - (c) 24 semester hours in courses selected from no more than two departments in the following—Anth 150, 151, 152, 171, 186, 187, 188, 263, 267, 273; Econ 101, 102, 105, 157, 158, 161, 199, 237; Envr 159–60, 161; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 124, 129; Psyc 104, 144, 151, 156; Soc 120, 126, 127, 130, 143, 181.
  - (d) Envr 151–52, 157.

*Bachelor of Science with a major in environmental studies (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses, with departmental permission, in order to include more elective courses in their program):
  - (a) Statistics—Stat 91.
  - (b) Natural sciences—12–18 semester hours selected from BiSc 11–12; Chem 11–12; Geol 1–2; Phys 1, 2, 5, 6. Either BiSc 11–12 or Chem 11–12 must be selected.
  - (c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; Soc 1, 2.
3. Required courses for the major (51 semester hours):
  - (a) BiSc 140; Econ 136; Geog 132.
  - (b) 23 semester hours selected from BiSc 101, 102, 103, 105, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 150, 166, 167, 168, 169, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 122, 125, 128, 141, 163; Phys 14, 15, 16, 127–28.
  - (c) 9 semester hours selected from Anth 150, 151, 152, 171, 186, 187, 188, 263, 267, 273; Econ 101, 102, 105, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135,



136, 137, 140, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 124, 129; Psyc 104, 144, 151, 156; Soc 120, 126, 127, 130, 143, 181.

(d) Envr 151-52, 157.

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than three departments. Not more than 6 hours of service-learning courses may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that, unless a Secondary Field of Study is chosen, permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and a maximum of 9 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 201, 203; CE 194, 197 (see the School of Engineering and Applied Science *Bulletin*); U&RP 153, 201. The permission of the instructor, the department chair, and the dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

**151-52 Senior Seminar in Environmental Studies (3-3)**

Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

**157 Introduction to Environmental Law (3)**

An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision making. Designed for students with no training in law.

**159-60 Field Experience (3-3)**

Open to juniors and seniors majoring in environmental studies. Students spend at least eight hours per week in a political, technical, legal, or special-interest organization working on environmental questions.

**161 Environmental Policy Internship (3 or 6)**

For students interested in environmental policy and decision making at the national level. The course consists of an internship with a federal agency or public interest group concerned with environmental affairs, a weekly seminar based on directed readings, guest speaker presentations, and a major term paper. (Summer)

## EXERCISE AND SPORT ACTIVITIES

See Human Kinetics and Leisure Studies.

## FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear (Chair)

Adjunct Professor C.G. McWright

Professorial Lecturers L.R. Goldbaum, E.G. Howe, C.E. Bohn, F.P. Pantuso, K.E. Melson, E.S. Hume

Associate Professors N.T. Lappas, W.F. Rowe

Associate Professorial Lecturers W.A. Bayse, S.R. Lorigo, R.E. Easton, G. Epstein, S.E. Garmon, H.T. Samway, S.S. Sohn, D.G. Wright

Assistant Professorial Lecturers L. O'Grady, S.W. Bentley, J.R. Carlon, W.E. Clancy, E.L. Lee II, J. Schloegel

**Master of Forensic Sciences**—Prerequisite: a bachelor's degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences or in law, medicine, or law enforcement.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law



school. The following are also required: (1) 9 hours selected from ForS 201, 202, 203, 204, and 205; (2) 9 hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination.

*Master of Science in the field of chemical toxicology*—Prerequisite: completion of the first three years of the combined B.S./M.S. program in chemical toxicology (see Chemistry Department) or its equivalent. Courses may be required to remove academic deficiencies.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The following courses are required: Bioc 221-22; Phyl 191; Phar 203; ForS 240, 245, and 242 or 270; two courses selected from ForS 246, 248, 249, 269; ForS 299-300 or Chem 299-300. Chem 134, 141-42, and Stat 127 will be required of students who have not had these courses or their equivalent. All candidates are required to pass a Master's Comprehensive Examination.

*Master of Science in Forensic Science*—Prerequisite: a bachelor's degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination.

*Master of Arts in the field of criminal justice*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work in the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274, 290, and Soc 259, 261 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the forensic sciences practicum.

*Master of Arts in the field of criminal justice with a concentration in crime in commerce*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the forensic sciences practicum.

*Master of Arts in the field of criminal justice with a concentration in security management*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). The program of study consists of course work drawing from the forensic sciences, law, criminology, management science, investigative techniques, and security management. Courses are selected from ForS 214, 224, 229, 232, 233, 234, 252, 254, 256, 257, 266, 267, 290, 295; Soc 263. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the security management practicum.



The interdisciplinary programs leading to the degrees of Master of Arts, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, the National Law Center, the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology and with the Council of Higher Education, Commonwealth of Virginia, in programs of mutual exchange of students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

A research field in forensic chemistry is available in the Ph.D. program in the Chemistry Department.

- 201 **Forensic Serology I** (3) Lappas, Rowe  
Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.
- 202 **Instrumental Analysis** (3) Rowe  
Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophotometric techniques and mass spectrometry. Laboratory exercises.
- 203 **Examination of Questioned Documents** (3) Bohn, Epstein  
Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.
- 204 **Firearms and Tool-mark Identification** (3) Rowe  
Methods for identifying firearms, cartridge casings, tool marks, tire marks, and footprints. Laboratory exercises.
- 205 **Personal Identification** (3) O'Rear, Rowe  
Methods of personal identification based on sketches, fingerprints, voiceprints, odontology, and study of skeletal remains.
- 214 **Forensic Psychiatry** (3) Howe, Hume  
Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.
- 220 **Physical Aspects of Forensic Sciences** (3) O'Rear, Rowe  
Survey of forensic physical sciences; fingerprints, firearm and toolmark examinations, document examinations, and examinations of trace evidence, such as glass, soil, paint, hairs, and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.
- 221 **Biological Aspects of Forensic Sciences** (3) Lappas, Rowe  
Principles of forensic pathology, serology, and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials; and the detection of drugs in biological materials.
- 224 **Criminal Law I** (3) Melson, O'Grady  
Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.
- 225 **Criminal Law II: Evidence** (3) Melson, O'Grady, Samway  
Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.
- 227 **Criminal Law III: Procedure** (3) Melson, O'Grady  
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, postconviction procedures. Prerequisite: ForS 224.
- 229 **Criminal Law IV: Contracts** (3) Easton  
Concepts and principles of law encountered in commercial activities: contracts, sales, negotiable instruments, and bankruptcy. Emphasis on recognition of de-



- ceptive contracting practices. Statutes and government regulation governing contracts.
- 232 **Crime in Commerce I: Accounting** (3) Lorigo  
Principles of accounting; abuse and misuse of accounting procedures; use of accounting in the investigation of commercial crime.
- 233 **Crime in Commerce II: Procurement and Supply** (3) Lorigo  
Governmental and private-sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.
- 234 **Crime in Commerce III: Information Systems** (3) Bayse  
Principles of management information systems; security of information systems and facilities; compromising of information systems.
- 235 **Crime in Commerce IV: Conspiracy** (3) Lorigo  
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.
- 240 **Principles of Toxicology** (4) Lappas  
Concepts of toxicology, including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors that influence toxicity and toxicity evaluation. Prerequisite: Phar 203 or permission of instructor.
- 242 **Chemistry of Organic Medicinal Agents** (3) O'Rear  
A correlated study of the composition, constitution, physical and chemical properties, and pharmaceutical uses of organic medicinal agents. Included are discussions of the heterocyclic chemistry of these agents.
- 245 **Analytical Toxicology** (4) Lappas  
A study of qualitative and quantitative principles and procedures used in the detection, identification, isolation, purification, and potency determination of drugs. Laboratory.
- 246 **Environmental Toxicology** (3) Lappas  
A study of the chemical substances to which humans are unintentionally exposed. Emphasis will be placed on pesticides, food additives, and air pollutants.
- 248 **Clinical Toxicology** (3) Staff  
A study of the adverse effects caused by or related to the use of drugs. The signs and symptoms, diagnoses, and treatments will be emphasized.
- 249 **Industrial Toxicology** (3) Staff  
A study of the potential hazards encountered by workers as a result of their exposure to raw materials, intermediates, and finished products. The types of exposure and methods of predicting and preventing toxic exposure will be emphasized.
- 250 **Interdisciplinary Aspects of Forensic Science** (3) Carlon, O'Rear  
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.
- 251 **Moot Court** (3) Clancy, Rowe  
Students prepare and present direct testimony and are cross-examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.
- 252 **Topics in Security Management** (3) Lee  
The broad spectrum of factors that shape modern security management: technology, government regulations and policies, corporate matters, information systems, legal principles, international programs, congressional committees, industrial organizations, associations. Potential areas of research and study.
- 254 **Selected Topics in the Forensic Sciences** (3) O'Rear  
Current issues in research, investigation, and law.
- 255 **Security Management I** (3) Lee  
Risk assessment and management, redundant security systems, cost-benefit



- analysis. Administration of personal, industrial, and physical plant security. Analysis of factors that facilitate decision making in security problems.
- 256 **Security Management II** (3) Lee  
Hostage situations, preparation of high-risk employees and spouses for hostage incidents, management of post-incident situations, hostage rescue groups.
- 257 **Management of Security Organizations** (3) Pantuso  
Theories of management, with emphasis on leadership and interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on organizations with security responsibilities, including government agencies, corporate entities, and the military.
- 260 **Principles of Forensic Medicine** (3) Sohn, Wright  
Anatomy and physiology of the human body, with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart as related to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.
- 261 **Principles of Forensic Pathology** (3) Sohn, Wright  
Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.
- 265 **Drugs of Abuse** (3) Lappas, O'Rear  
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. degree candidates; open to others with permission of instructor.
- 266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear, Courtless  
Recent advances in criminal justice. Discussions incorporate several disciplines, including science, law, management, social sciences, and psychology.
- 267 **Seminar: Crime in Commerce** (3) Lorigo  
Interdisciplinary course in current problems in the investigation and prosecution of commercial offenses.
- 268 **Photography in the Forensic Sciences** (3) Wright  
Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, \$35.
- 269 **Forensic Toxicology I** (3) Lappas  
Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.
- 270 **Medicinal Chemistry** (3) O'Rear  
Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.
- 271 **Forensic Serology II** (3) Lappas  
Methods in forensic serology. Laboratory examinations and classifications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, \$35. Prerequisite: ForS 201 or permission of instructor.
- 272 **Forensic Toxicology II** (3) Lappas  
Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 245 or 269 or permission of instructor. Laboratory fee, \$35.
- 273 **Forensic Chemistry I** (3) Rowe  
Examination of glass, soils, hairs, and fibers. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, \$35.



- 274 **Management of Criminal Justice Organizations** (3) O'Rear  
Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.
- 280 **Forensic Chemistry II** (3) Rowe  
Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas-liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, \$35.
- 290 **Research in Criminal Justice** (3) Courtless, Schloegel  
An examination of the role and process of research as it serves the criminal justice systems. Presentations and discussions of the literature with emphasis on the use of research and analysis in formulating and evaluating criminal justice policy.
- 295 **Research** (arr.) Staff  
Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.
- 297 **Security Management Practicum** (1) O'Rear  
Open to qualified master's degree students. Internship experience in an agency or corporate unit with security responsibilities, under the supervision of an appropriate staff member. Students must preregister for the course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree.
- 298 **Forensic Sciences Practicum** (1) O'Rear  
Open to qualified master's degree students. Internship experience in a forensic science laboratory or criminal justice agency, under the supervision of an appropriate staff member. Students must preregister for this course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree.
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

## FRENCH

See **Romance Languages and Literatures.**

## GENETICS—GRADUATE PROGRAMS

### Committee on Genetics

S.O. Schiff (Director), W.F. Anderson, K.M. Brown, D.J. Brusick, R.G. Crystal, P. Czerski, R.F. De Giovanni-Donnelly, W. Drohan, R.C. Gallo, C.T. Garrett, D. Goldman, G. Hager, B.H. Howard, L.W. Hoyer, D.E. Johnson, K.A. Kennedy, P.D. Kind, A. Kumar, J.W. Larsen, W.M. Leach, J. Leonard, R. Mage, K.H. McKenney, C.R. Merrill, T.W. Moody, D. Morris, P. Noguchi, S. O'Brien, U.R. Rapp, K.N. Rosenbaum, B. Safer, J. Schlom

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Biochemistry, Biological Sciences, Microbiology, Obstetrics and Gynecology, Pathology, and Pharmacology and from government agencies and private industry.

A bachelor's degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: 8 semester hours each in biology, inorganic chemistry, and organic chemistry; 6 semester hours in physics; 6 semester hours in English composition and literature; one course in at least two of the following areas: genetics, cell biochemistry, cell or molecular biology.

Master of Science in the field of genetics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 semester hours required in this



program must include Gnet 201 and Gnet 299-300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below.

*Doctor of Philosophy in the field of genetics*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must include Gnet 301, 8-10 semester hours of biochemistry, 6-8 semester hours of cell biology, 10-12 semester hours of genetics, and 3 semester hours of statistics. These courses may be selected from the departmental listings below. (Course descriptions are listed under the department concerned.)

- 201 **Advanced Problems in Genetics** (2) Staff  
Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the Genetics Program. Limited to students enrolled in the Genetics Program unless special permission is obtained from the director. (Fall)
- 256 **Biochemical Genetics and Inherited Metabolic Diseases** (2) Merrill  
(Formerly Bioc 256)  
Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. (Spring)
- 295 **Research** (arr.) Staff  
Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Academic year)
- 301 **Advanced Problems in Genetics** (2) Staff  
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the Genetics Program. Limited to students enrolled in the Genetics Program unless special permission is obtained from the director. (Fall)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

- Anat 203 Human Developmental Anatomy
- Bioc 221-22 General Biochemistry
- Bioc 223 Physical Biochemistry
- Bioc 231 Bioenergetics
- Bioc 250 Molecular Biology
- Bioc 251 Advanced Topics in Molecular Biology
- Bioc 252 Biochemical and Molecular Aspects of Selected Diseases
- Bioc 270 Biochemistry and Cell Biology of the Immune Response
- BiSc 111 Introductory Microbiology
- BiSc 122 Cell Biology
- BiSc 123 Cell Biochemistry
- BiSc 124 Cell Biochemistry Laboratory
- BiSc 127 Genetics
- BiSc 128 Genetics Laboratory
- BiSc 138 Advanced Genetics
- BiSc 145 Introduction to Vertebrate Embryology
- BiSc 146 Experimental Developmental Biology
- BiSc 167 Radiation Biology
- BiSc 212 Seminar in Comparative Reproductive Biology
- BiSc 220 Seminar: Cell or Plant Biochemistry
- BiSc 227 Seminar: Genetics
- BiSc 228 Population Genetics



BiSc 229	Cytogenetics
BiSc 230	Human Genetics
BiSc 248	Analysis of Development
BiSc 249	Seminar: Developmental Biology
BiSc 272	Electron Microscopy
BiSc 274	Gene Regulation and Genetic Engineering
BiSc 275	Introduction to Recombinant DNA Techniques
Micr 211	Microbiology
Micr 214	Tissue Cell Culture
Micr 219	Scientific Writing
Micr 229	Immunology
Micr 230	Immunology Laboratory
Micr 233	Virology
Micr 234	Virology Laboratory
Micr 258	Microbial Genetics
Micr 260	Cellular Immunology
Phar 203	Fundamental Principles of Pharmacology
Phar 222	Genetic Toxicology
Phar 258	Cancer Chemotherapy
Stat 127	Statistics for the Biological Sciences
Stat 129	Introduction to Computing

### GEOBIOLOGY—GRADUATE PROGRAMS

#### Committee on Geobiology

A.G. Coates (Chair), A. Brooks, M.A. Buzas, R.E. Knowlton, D.L. Lipscomb, H. Merchant, A. Viterito

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of geobiology. The program is directed by a committee whose members are drawn from the Departments of Anthropology, Biological Sciences, Geography and Regional Science, and Geology. It is enhanced by cooperative relationships with the Smithsonian Institution and the U.S. Geological Survey.

A bachelor's degree in anthropology, biology, botany, geography, geology, or zoology from this University, or an equivalent degree from another accredited institution of higher learning, is required for admission to the program. Prerequisite University courses (or equivalent courses elsewhere) include the following: BiSc 101 or 104 or Anth 186, BiSc 108 or Anth 187, BiSc 140; Geol 2, 151 or 154 or Anth 188; Stat 91.

**Master of Science in the field of geobiology**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Required courses include BiSc 107 or 168 or 169, 208, 209; Geol 195, 254, and 255. Electives are selected from the following (to total, with the required courses, at least 30 semester hours): Anth 152, 183–84, 186, 187, 188, 201, 204, 283, 294; BiSc 102, 103, 104, 105, 106, 110, 138, 141, 143, 144, 162, 168, 169, 204, 207, 210, 211, 221, 227, 228, 229, 242, 243; Geog 104, 106, 108, 219, 220; Geol 105, 125, 128, 152, 154, 158, 163, 175, 181, 241, 253, 258, 263, 266.

**Doctor of Philosophy in the field of geobiology**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 48 semester hours of course work, plus a dissertation (equivalent to 24 semester hours). Required courses include: BiSc 107, 208, 209, 211, 228; Geol 125, 195, 254, 255, 263. Electives are to be selected from remaining elective courses listed for the master's degree (to total, with the required courses, at least 48 semester hours).

**Research fields:** Any subdiscipline of anthropology, biology, geography and/or geology that pertains to research in ecology and evolution.



## GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon, J.C. Lowe, D.E. Vermeer (Chair)  
 Professorial Lecturers E. Marasciulo, G.J. Demko, B. Thomas  
 Associate Professorial Lecturers J.A. Zinn, J. Banister, S.E.S. Mastran  
 Assistant Professors A. Viterito, M.W. Lewis  
 Assistant Professorial Lecturers S. Wright, W.B. Wood

**Bachelor of Arts with a major in geography (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in the major—Geog 1, 2; 30 semester hours of second-group geography and regional science courses to be chosen in consultation and with the approval of the undergraduate advisor. One course must be chosen from each of the following: Group A—Geog 108, 110, 132, 136; Group B—Geog 125, 126, 140, 141; Group C—Geog 127, 133, 145, 146; Group D—Geog 104, 105, 106, 107.

**Minor in geography**—Required: 21 credit hours, including Geog 1, 2, and one course from each of the following groups: Group A—Geog 127, 145, 146; Group B—Geog 125, 126, 141; Group C—Geog 108, 110, 137; Group D—Geog 132, 134, 135, 136; Group E—Geog 124, 140, 143.

**Master of Arts in the field of geography**—Prerequisite: a bachelor's degree with a major in geography or in a related field in the social or natural sciences.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work must include Geog 105 (*Techniques of Spatial Analysis*) and Geog 250 (*Regional Development*).

Thesis and nonthesis options are available: The thesis option requires a minimum of 30 semester hours of course work, including *Thesis Research*; the nonthesis option requires completion of 36 credit hours of graduate work. All degree candidates must take a Master's Comprehensive Examination that covers the substance of academic work pursued under the program of study.

Students entering the program without a bachelor's degree with a major in geography will be required to take prerequisite courses as determined by the department. All entering students must have completed one course, or its equivalent, from each of the following groups: physical/resource geography (Geog 108, 132, 135); population/cultural/political geography (Geog 127, 145, 146); urban/economic geography (Geog 125, 140, 141).

Depending upon the chosen field of specialization, each student will select electives from appropriate courses within the department or from related programs and departments within the University or the Consortium of Universities. The student's program of study will be developed in consultation with the advisor and graduate committee.

**Master of Science and Doctor of Philosophy in the field of geobiology**, see Geobiology.

### First Group

- 1 **Introduction to Geography I** (3) Lowe, Gordon, Vermeer  
A systematic survey of human geography; cultural perspectives on the use of space, including urbanization, geopolitics, and land use. (Fall and spring)
- 2 **Introduction to Geography II** (3) Vermeer, Viterito  
A systematic survey of environmental geography; perspectives on environments and human ecology, including ecosystems and their use, human population dynamics, and resource geography. (Fall and spring)
- 3 **The Physical Environment** (3) Viterito  
A study of the earth's physical environment, its systems, subsystems, and physical processes. Laboratory fee, \$25.



## Second Group

- 104 **Maps and Mapmaking** (3)  
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, \$25. Wright
- 105 **Techniques of Spatial Analysis** (3)  
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Viterito
- 106 **Remote Sensing of the Environment** (3)  
Examination of the principles and applications of remote sensing techniques using color infrared, microwave, and satellite imagery. Laboratory fee, \$25. Viterito
- 107 **Air Photo Interpretation** (3)  
Use of aerial photography for problems in land use, urban analysis, archaeology, and environmental monitoring. Laboratory fee, \$25. Thomas
- 108 **Weather and Climate** (3)  
An examination of atmospheric processes and climatic regions. Laboratory fee, \$25. Prerequisite: Geog 2. Viterito
- 110 **Climate and Human Ecology** (3)  
Effects of climate on human activities. Examination of human-induced climate change. Prerequisite: Geog 2. Viterito
- 120 **Geographic Information Systems** (3)  
Analysis of cartographic data structures and automated mapping data bases. Examination of digitizing and plotting techniques. Laboratory fee, \$25. Staff
- 121 **Computer Mapping** (3)  
Analysis and application of computer mapping methods. Examination of FORTRAN and BASIC programming methods as they apply to cartography. Laboratory fee, \$25. Staff
- 124 **Urban Transportation** (3)  
The relationship between freight and passenger transportation systems and urban land use patterns and structure. Prerequisite: Geog 1. Lowe
- 125 **Transportation and Communication** (3)  
The structure and evolution of transportation and communication networks and their impact on regional development. Prerequisite: Geog 1. Lowe
- 126 **Location in Manufacturing and Agriculture** (3)  
Theories dealing with the location and dynamics of economic activities. Prerequisite: Geog 1. Staff
- 127 **Population and Settlement** (3)  
Patterns of world population; factors contributing to population pressures, growth, and migrations. Prerequisite: Geog 1. Gordon
- 132 **Resource Management and Conservation** (3)  
The global distribution, utilization, and degradation of natural resources. Prerequisite: Geog 2. Lewis
- 133 **People, Land, and Food** (3)  
Spatial disparities in world food production, demand, and distribution; regional food-population balances; food supply problems and prospects. Prerequisite: Geog 1 or 2. Gordon
- 134 **Energy Resources** (3)  
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations. Prerequisite: Geog 2. Staff
- 135 **Resources and Environmental Quality** (3)  
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence resource use. Prerequisite: Geog 2. Lewis
- 136 **Water Resources** (3)  
Analysis of the global spatial patterns, development, and use of water resources. Prerequisite: Geog 2. Viterito, Lewis



- 137 **Environmental Hazards** (3) Viterito  
Examination of natural hazards in terms of their types, distributions, and impacts on human activities. Prerequisite: Geog 2.
- 140 **Urban Form and Dynamics** (3) Staff  
Analysis of the internal spatial structure of cities; emphasis on explaining patterns and dynamics of location within the city. Prerequisite: Geog 1.
- 141 **Urban Settlement** (3) Staff  
The location of cities, urbanization processes, theories and models of urban location and development. Prerequisite: Geog 1.
- 143 **Urban Social Geography** (3) Lowe  
Behavioral perspectives on human spatial activities in cities. Prerequisite: Geog 1.
- 144 **Explorations in Historical Geography** (3) Mondale  
Examination of selected themes in the cultural geography of the United States over the course of its history, in relation to an overview of the historical geography of the country. Same as AmCv 144. (Spring)
- 145 **The Cultural Landscape** (3) Lewis  
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. Prerequisite: Geog 1.
- 146 **Politics in Place and Space** (3) Staff  
Interrelationships among the human and physical environment and political systems; the organization of political territories. Prerequisite: Geog 1.
- 147 **Military Geography** (3) Gordon  
An examination of environmental and locational factors and their impact on military planning and operations. Prerequisite: Geog 1 or 2.
- 151 **Man and Land in North America** (3) Staff  
An examination of the social, environmental, and economic factors that have led to development of the several regions of the U.S. and Canada. Prerequisite: Geog 1 or 2.
- 154 **Man and Land in the Middle East and North Africa** (3) Gordon  
Cultural and physical regional patterns of the Middle East and North Africa. Prerequisite: Geog 1 or 2.
- 161 **Man and Land in Latin America** (3) Gordon  
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. Prerequisite: Geog 1 or 2.
- 189-90 **Readings in Geography** (arr.) Staff  
Prerequisite: 12 credit hours of geography and permission of instructor.
- 198 **Special Topics** (3) Staff  
Consideration of geographic aspects of topical and future problems of society. May be repeated for credit provided that the topic differs. Prerequisite: Geog 1 or 2.
- 199 **Internship** (3) Staff  
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography. Prerequisite: 12 credit hours of geography courses and permission of instructor.

### Third Group

- 219 **Seminar: Climatology** (3) Viterito  
Atmospheric circulation systems, controls, and distribution. Elements of synoptic climatology, including climate modeling.
- 220 **Seminar: Climatic Change** (3) Viterito  
Climatic history; examination of natural and induced climatic change.
- 222 **Seminar: Resources and the Environment** (3) Staff  
Analysis of the spatial variations and interrelationships of resources and the environment.
- 223 **Seminar: The Population-Food Balance** (3) Gordon  
Spatial problems associated with the dynamics and interaction of population growth and agricultural output.



- 224 **Seminar: Political Geography (3)** Staff  
Examination of the political factor in location theory and analysis of the nature of political territories. Lowe
- 225 **Seminar: Transportation and Development (3)** Lewis  
Transportation and communication in the organization of space.
- 230 **Seminar: Resource Issues in Development (3)** Lewis  
A consideration of the differential regional implications of and responses to resource and environmental policy decisions due to regional differences in societal and physical parameters. Lowe
- 243 **Seminar: Urban Geography (3)** Staff  
Evolving morphology and internal spatial patterns of cities.
- 244 **Seminar: Urban Systems and Development (3)** Staff  
Central place theory and other theories of urban location and the organization of systems of cities.
- 250 **Regional Development (3)** Gordon  
Geographic perspectives on the policy, planning, and programmatic aspects of regional development.
- 261 **Latin American Geopolitical Trends (3)** Marasciulo  
Political and economic factors in a development context; emphasis on natural and human resources and environmental and land use issues.
- 265 **Seminar: Geography of the Soviet Union (3)** Staff  
Survey of U.S.S.R. regions and major topical themes of Soviet geography, including population, energy, agriculture, transportation, and regional development.
- 266 **Seminar: Geographic Perspectives on Contemporary China (3)** Banister  
China's development prospects: environmental constraints, population growth, and regional differences in the context of Chinese cultural patterns and political organization.
- 287 **Seminar: Problems in Latin American Civilization (3)** Staff  
Same as IAff 287.
- 290 **Principles of Demography (3)** Boulier  
Same as Econ/Soc/Stat 290.
- 291 **Methods of Demographic Analysis (3)** Boulier  
Same as Econ/Soc/Stat 291.
- 295 **Research (arr.)** Staff  
May be repeated for credit.
- 299-300 **Thesis Research (3-3)** Staff

## GEOLOGY

Professors F.R. Siegel, A.G. Coates, R.C. Lindholm, J.F. Lewis, D.J. Stanley (Research), G.C. Stephens (Chair)  
Adjunct Professors J.W. Pierce, M.A. Buzas, W. Back  
Professorial Lecturer C.B. Cecil  
Associate Professorial Lecturers J.F. Sutter, J.H. Kravitz  
Assistant Professors R.P. Tollo, L.E. Osterman  
Assistant Professorial Lecturers F.J. Collier, R.W. Stanton, L.E. Edwards, M.J. Baedecker, G.B. Rabchevsky  
Lecturers R.T. Rye, M.K. Brett-Surman

*Bachelor of Arts or Bachelor of Science with a major in geology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory course—Geol 1-2.
3. Required courses in related areas—(a) Chem 11-12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or 12 or Phys 1 (for the Bachelor of Arts) or BiSc 11 or 12 and Phys 1 (for the Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 151-52 for both the



degrees of Bachelor of Arts and Bachelor of Science; Geol 166, 189, 195 for the Bachelor of Science degree only.

For graduation with Special Honors, a student must have an overall grade-point average of 3.3 plus the recommendation of the department; must take Geol 199 for 2 or 3 credit hours; and must submit an approved honors thesis or project report.

**Minor in geology**—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1-2; 5 and 105); two courses selected from Geol 111, 122, 151; and two from Geol 124, 125, 128, 150, 261, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

**Master of Science in the field of geology**—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology and scores on the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work must include Geol 205, 240, 261, and 272. Candidates are required to pass a Master's Comprehensive Examination.

Both a thesis and nonthesis option are available. Under the thesis option, a minimum of 30 semester hours of course work is required, including Thesis Research; candidates must pass the Master's Comprehensive Examination before submitting their thesis work. Under the nonthesis option, a minimum of 36 semester hours of course work is required; course work must include Geol 128, 189, 219, 274, and 295. Two electives must be chosen from Geol 216 or 263, 211 or 224, 241 or 243, and 158 or 254 or 266.

A concentration in hydrogeology is available as a nonthesis program. A minimum of 36 semester hours is required, including Geol 128, 189, 274, 275, 276, and 249, plus Stat 129. (Geol 205 and 272 are not required for this concentration.) The Department recommends that the program include field hydrogeology, which is not available at the University and should be taken elsewhere.

**Master of Science in the field of geochemistry** (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a bachelor's degree with a major in geology or in chemistry and, at a minimum, introductory courses in the other field.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111-12; Geol 240, 241 or 243, 249; Chem 213 or other upper-level chemistry course approved by the advisor; and Geol 299-300. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. Stat 129 or another course approved by the advisor must be passed.

**Master of Science and Doctor of Philosophy in the field of geobiology**—see Geobiology.

**Doctor of Philosophy in the field of geology**—Required: the general requirements stated under the Graduate School of Arts and Sciences and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

**Research fields:** geochemistry, hydrogeology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, and structural geology.

**Doctor of Philosophy in the field of geochemistry** (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the satisfactory completion of Stat 129 and either Stat 117 and 118 or Stat 91, and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

### First Group

#### 1-2 Introductory Physical and Historical Geology (3-3)

Stephens, Tollo, Lindholm, Osterman

Lecture (3 hours), laboratory (2 hours). An introduction to the principal features of the composition, structure, and history of the earth. Topics include nature of



minerals and rocks, physical processes, energy resources, plate tectonics, origin of life, and evolution. Prerequisite to Geol 2: Geol 1 or 5. Laboratory fee, \$25 per semester. Credit will not be given for both Geol 1 and 5. (Academic year)

### 5 Environmental Geology (3)

Lecture (2 hours), laboratory (2 hours). An introduction to the principal features of physical geology, with emphasis on the relation of people and society to natural environments; population evolution, natural hazards, and mineral resources; economic, legal, and political aspects. Laboratory fee, \$20. Credit will not be given for both Geol 1 and 5. (Fall and spring)

## Second Group

### 101 Rocks and Minerals (3)

Lecture and laboratory; field trips as arranged. Identification, classification, and interpretation of igneous, sedimentary, and metamorphic rocks, based on their minerals, textures, primary structures, and present-day processes. Laboratory work emphasizes use of a hand lens in making observations; advanced techniques are introduced. Field trips demonstrate rock structures and genetic associations. Prerequisite: Geol 1 or 5. Prerequisite or concurrent registration: Geol 1-2 or 105. (Spring)

### 105 Geological Hazards in Land-Use Planning (3)

Lecture and laboratory. An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 1 or 5, or permission of instructor. Laboratory fee, \$15. (Spring)

### 111 Mineralogy (4)

Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1; Chem 11 (may be taken concurrently); or permission of instructor. Laboratory fee, \$22. (Fall)

### 112 Optical Mineralogy (4)

Basic light theory, optical characterization of minerals, thin section analysis. Prerequisite: Geol 111. Laboratory fee, \$26. (Spring)

### 117 Petrology (2)

Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 1, 111, 112; Phys 1 or equivalent; or permission of instructor. (Fall)

### 118 Petrology Laboratory (2)

Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111 and 112. Laboratory fee, \$26. (Fall)

### 122 Structural Geology (4)

Study of natural and experimental rock deformation and the relationships between stress and strain as recorded by geologic structures. Prerequisite: Geol 1-2. Laboratory fee, \$10. (Fall)

### 124 Geologic Map Interpretation (2)

Interpretation and analysis of geologic maps and cross sections. Prerequisite: Geol 122. Laboratory fee, \$5. (Spring)

### 125 Marine Geology (3)

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1 or permission of instructor. (Spring)

### 128 Geomorphology (3)

Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 1. Laboratory fee, \$10. (Spring)

### 136 Introduction to Engineering Geology (3)

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, \$20. (Fall and spring)



- 150 **Dinosaurs: Evolution and Natural History** (3) Brett-Surman  
An introductory course on the natural history of dinosaurs—their evolution, biology, and ecology, their false portrayal in the press, and how scientists study them. (Spring and summer)
- 151–52 **Invertebrate Paleontology** (3–3) Osterman, Collier  
Biology, taxonomy, functional morphology, and evolutionary patterns of the invertebrate fossil groups, with emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or permission of instructor. Laboratory fee, \$20 per semester. (Academic year)
- 154 **Vertebrate Paleontology** (3) Brett-Surman  
Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. (Fall, odd years)
- 166 **Principles of Stratigraphy** (3) Osterman  
Fundamentals of stratigraphic principles and practice. Review of historical concepts, section measuring, vertical and lateral lithostratigraphic relationships, magnetic and climatic stratigraphy, biostratigraphic classification, zonation, correlation, geochronology, facies, and stratigraphic maps. Prerequisite: Geol 151–52 or permission of instructor. (Fall)
- 189 **Geophysics for Geologists** (3) Stephens  
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 1–2; Math 31; Phys 1; or permission of instructor. (Spring)
- 195 **Field Methods** (3) Tollo, Stephens  
Weekend field trips. Surveying, geological mapping, and specific field work methods. Students will be responsible for room and board expenses while at field camp (one week). Prerequisite: Geol 122. Laboratory fee (field trip fee), \$20. (Spring)
- 199 **Undergraduate Research or Reading** (arr.) Staff  
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

### Third Group

- 205 **Seminar in Geology** (1) Staff  
Special topics each semester. May be repeated for credit.
- 211 **Advanced Mineralogy** (3) Tollo  
Crystal chemistry, phase relations, and paragenesis of major rock-forming minerals. Prerequisite: Geol 111 or permission of the instructor. (Spring, odd years)
- 216 **Sedimentary Petrography** (3) Lindholm  
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 112, 163; or permission of instructor. Laboratory fee, \$25. (Fall, odd years)
- 219 **Petrogenesis I** (3) Lewis  
The origin of selected igneous and metamorphic rock types. Prerequisite: Geol 117, 118, or permission of instructor. Laboratory fee, \$22. (Fall)
- 220 **Petrogenesis II** (3) Lewis  
Laboratory fee, \$22. (Spring)
- 224 **Advanced Structural Geology** (3) Stephens  
Study of problems in structural analysis and tectonics. Prerequisite: Geol 122. (Spring, odd years)
- 240 **Principles of Geochemistry** (3) Siegel  
Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisite or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 31; Phys 1 or 3; or permission of instructor. Laboratory fee, \$15. (Fall)
- 241 **Marine Geochemistry** (3) Siegel  
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical



- activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, or permission of instructor. Recommended: Chem 22. Laboratory fee, \$20. (Spring, even years)
- 243 **Geochemical Prospecting** (3) Siegel  
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geol 141. Laboratory fee, \$20. (Spring, odd years) Staff
- 249 **Seminar: Geochemistry** (2) Coates  
Independent topics each semester; may be repeated for credit.
- 254 **Evolutionary Paleobiology** (3) Coates  
Consideration of modern evolutionary theory with emphasis on the fossil record. (Fall, even years)
- 255 **Quantitative Paleocology** (3) Buzas  
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151-52, Stat 91; or permission of instructor. (Fall, odd years) Osterman
- 257 **Micropaleontology** (3) Osterman  
Biology, morphology, paleoecology, biogeography, and biostratigraphy of marine and nonmarine phosphatic, organic, siliceous, and calcareous microfossils. Prerequisite: Geol 1-2 or permission of instructor. (Fall, even years)
- 258 **Seminar: Micropaleontology** (3) Osterman  
Prerequisite: Geol 158 or permission of instructor. May be repeated for credit. (Fall, odd years)
- 261 **Sedimentology** (3) Lindholm  
Lecture and laboratory, field trips as arranged. Principles of sedimentology, analysis and interpretation of sedimentary processes and environments. Prerequisite: Geol 1; Stat 91; or permission of instructor. Laboratory fee, \$22. (Spring)
- 263 **Sedimentary Environments** (3) Lindholm  
Study of selected depositional environments. Field trips as arranged. Prerequisite: Geol 163; Stat 91. Laboratory fee (field trips), \$20. (Fall, even years) Edwards
- 266 **Advanced Stratigraphy** (3) Edwards  
Analysis of special topics in stratigraphy. Historical background, concept of facies, cycles of sedimentation, clastic and carbonate subsurface lithofacies, subsurface biostratigraphy, ecological and evolutionary attributes of stratigraphically useful organisms, quantitative methods, isochronology, geochronology, and magnetic stratigraphy. Prerequisite: Geol 166 or equivalent. (Spring, even years)
- 268 **Geology of Coal** (3) Stanton, Cecil  
Geologic setting, petrography, and physical/chemical characteristics of coal. Prerequisite: Geol 117, 118, and 163. Laboratory fee, \$20. (Spring, even years) Tollo
- 272 **Regional Geology of North America** (3) Back  
Petrology, stratigraphy, and structure of various physiographic and tectonic provinces. (Spring, even years)
- 274 **Hydrogeology** (3) Back  
The occurrence, storage, movement, quality, and problems of pollution of subsurface water and the hydrologic properties of water-bearing materials. Prerequisite: Geol 111, 122; Math 31; Chem 11-12; or permission of instructor. Laboratory fee (field trips), \$8. (Spring)
- 275 **Geochemistry of Groundwater** (3) Back  
Application of geochemical principles to the interpretation and prediction of groundwater activity in regional systems; carbonate and silicate equilibrium; weathering and redox reactions; isotopes; and contaminated aquifers. Prerequisite: Geol 175, 141 (may be taken concurrently), or permission of instructor. (Fall, odd years)



- 276 **Advanced Groundwater: Modeling** (3) Staff  
Review of basic theory of aquifer systems, analysis of aquifer testing, and numerical methods applied to groundwater problems. Prerequisite: Geol 175 or permission of instructor. A knowledge of FORTRAN is desirable. (Spring, odd years)
- 295 **Research** (arr.) Staff  
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

#### Fourth Group

- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

#### GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt, C. Steiner (Chair)  
Associate Professorial Lecturer P. Werres  
Assistant Professorial Lecturers G.A. Koskella, I. Thoenelt-Winter

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—  
The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Ger 1-2, 3-4 (Ger 5-6 may be substituted), 9-10, 51-52, or equivalent.
3. Required courses in other areas—6 semester hours in one of the following subjects: art history, music history, philosophy, or history of Germany.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179-80; reasonable proficiency in speaking, reading, and writing German as determined by the department.

Minor in German—Required: Ger 9-10, 51-52, and 6 semester hours of second-group courses. Prerequisite: Ger 1-2, 3-4 (Ger 5-6 may be substituted), or equivalent.

Special Honors—In addition to the general requirements stated under Regulations, a candidate for special honors in German must submit an acceptable senior thesis on an assigned topic.

**Placement Examination:** A student who has not been granted advanced standing and who wishes to continue in college the language study begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

#### GERMAN

##### First Group

- 1-2 **First-Year German** (3-3) Staff  
Structure of the German language; basic vocabulary, reading, writing, and conversation; the culture of German-speaking areas. Three hours in the classroom and one in the language laboratory each week. Laboratory fee, \$35 per semester. Prerequisite to Ger 2: Ger 1 or equivalent. (Fall and spring)
- 3-4 **Second-Year German** (3-3) Staff  
Continued consideration of the structure of the German language; further development of vocabulary, reading, writing, and conversation; culture and literature



of Germany, Austria, and Switzerland. Three hours in the classroom and one in the language laboratory each week. Laboratory fee, \$35 per semester. Prerequisite to Ger 3: Ger 1-2 or 5, or equivalent. Prerequisite to Ger 4: Ger 3 or equivalent. (Fall and spring)

- 5-6 **Intensive Beginning and Intermediate German** (6-6) Thoenelt and Staff  
Six hours in the classroom and two in the language laboratory each week. Ger 5 is equivalent to Ger 1-2; Ger 6 is equivalent to Ger 3-4. Laboratory fee, \$70 per semester. Prerequisite to Ger 6: Ger 1-2 or 5, or equivalent. (Academic year)

- 9-10 **German Conversation and Composition** (3-3) Steiner  
A third-year language course; German as a means of spoken and written communication. German cultural history from its historical roots to the present day. Prerequisite: Ger 3-4 or 6, or equivalent. With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4. (Academic year)

- 47 **Beginning German for Reading Acquisition** (3) Staff  
For undergraduate and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

- 49 **German Readings for Nonmajor Students** (3) Staff  
Primarily for graduate students preparing for reading examinations; undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4, 6, or 47, or equivalent. (Spring)

- 51-52 **Introduction to German Literature—in English** (3-3) Thoenelt  
Ger 51—Origins of the German way of life: the Germanic loss of paradise (*Song of the Nibelungen*), the discovery of modern identity consciousness (*Parzival*), and passion as a value to be realized in life (*Tristan and Isolde*). Medieval love songs, the birth of modern individualism, and the eighteenth-century youth movement leading to the German idyll. Ger 52—German thought and civilization, from 1770 to the present; German education and social activity. The two faces of contemporary Germany: Goethe and German culture versus German politics; Germany during National Socialism and since World War II. (Academic year)

## Second Group

- 103-4 **Major Themes of German Literature—in English** (3-3) Thoenelt and Staff

Topics for 1990-91: Ger 103—The Faust myth in Western literature. Faust's, or man's, pursuit of happiness; its religious, philosophical, and aesthetic possibilities and limitations. Original sin in the Bible; Faust in classical and Germanic mythology; Faust figures in the works of Goethe, Dostoevsky, Stephen Vincent Benét, Paul Valéry, Thomas Mann, Camus, and other writers. Ger 104—Literature and politics in Germany: Kultur and politics, the two faces of Germany. A survey of these two aspects of German history and German life. Selected readings from relevant literary and political documents by Walther v. d. Vogelweide, Kant, W. v. Humboldt, Frederick II, Mme. de Staël, Goethe, Schiller, Marx, Heine, Nietzsche, Thomas Mann, Heinrich Mann, Brecht, and Böll. (Alternate academic years)

- 112 **Comparative Studies in Germanic Literatures—in English** (3) Thoenelt and Staff

Topic for 1990: Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. Selected works and excerpts from Plato, Aristotle, Shakespeare, Montaigne, Goethe, Schiller, Nietzsche, Thomas Mann, Camus, Böll, and others. (Spring, alternate years)

- 114 **Four Western Ways of Life—in English** (3) Thoenelt and Staff

The human condition and four Western ways of life: French moralism, German Bildung, Marxism, and existentialism. Selected readings from Montaigne, Goethe, Schiller, Thomas Mann, Marx, Brecht, Nietzsche, Martin Buber, and Camus. (Fall, alternate years)



- 125 **Utopias and Dystopias in German Letters and Thought—in English** (3) Steiner  
The unfolding German intellectual genius, now at a moral peak, now perverted. Selected readings and excerpts from the works of Lessing, Bonaventura, Heine, Marx, Nietzsche, Hitler, Thomas Mann, and Hermann Hesse. (Summer)
- 126 **France and Germany—in English** (3) Thoenelt and Staff  
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Spring, alternate years)
- 131-32 **18th-Century German Life and Letters—in German** (3-3) Thoenelt  
Germany as the country of poets and thinkers; Goetheanism or the German way of life; its roots in the middle ages, its full development in the 18th century, and its modern manifestation in anthroposophy. Relevant readings in literature, education, philosophy, religion, and politics by Wolfram von Eschenbach, Luther, Lessing, Kant, Goethe, Schiller, Schleiermacher, Wilhelm von Humboldt, Thomas Mann, and Rudolf Steiner. (Alternate academic years)
- 141-42 **19th-Century German Literature—in German** (3-3) Steiner  
Romanticism, Biedermeier, Young Germany, Poetic Realism. Second age of chivalry and *Sehnsucht*, revolution and counterrevolution in thought and literature. Development of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture, and discussion. (Alternate academic years)
- 151-52 **20th-Century German Literature—in German** (3-3) Steiner  
The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hermann Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Alternate academic years)
- 161-62 **Studies in Germanic Languages and Literatures—in English** (3-3) King  
Topics for 1989-90: Germanic mythology—characters, tales, and motifs. Runes as a cultic device. Introduction to the pre-Christian religion of the Germanic peoples and to an interdisciplinary study of mythology. Richard Wagner's use of Germanic lore in his opera *Siegfried*. (Academic year)
- 179-80 **Advanced German Conversation and Composition** (3-3) Thoenelt  
A fourth-year language course designed to achieve near-native fluency in speaking and writing German. Discussions and compositions on literary and cultural topics, reading of the German weekly newspaper *Die Zeit*, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammatical and stylistic studies. Prerequisite: Ger 9-10 or equivalent. (Alternate academic years)
- 183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy  
Same as Engl/Fren/Hist/Rel 183 and Art 187.

## SANSKRIT

- 105-6 **First-Year Sanskrit** (3-3) King  
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural and oral practice in language laboratory. Laboratory fee, \$35 per semester. (Alternate academic years)
- 107-8 **Second-Year Sanskrit** (3-3) King  
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural and oral practice in language laboratory. Laboratory fee, \$35 per semester. Prerequisite: Ger 105-6 or equivalent. (Alternate academic years)



**GERONTOLOGY—GRADUATE PROGRAM**

Professors R.G. Brown (Academic Director), R.A. Kenney  
 Professorial Lecturer M.H. Morrison

**Academic Committee:** R.G. Brown, J.C. Heddesheimer, R.A. Kenney, S.D. Infeld

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in gerontology, directed by the Committee on Gerontology and drawing upon faculty from various departments within the University and resource persons in the community.

The gerontology program derives its theoretical perspectives and substantive knowledge from several disciplines to provide a balanced study of the processes of aging and the societal reactions and responses to the aged and their problems, with the objective of preparing persons for positions that involve the planning, development, and evaluation of programs serving older persons. Each student will work closely with an advisor to design a program of studies appropriate to individual interests and professional objectives. Every student will have field experience in an agency involved in the planning and evaluation of services for the elderly. Prospective candidates should consult with the director of the gerontology program.

**Master of Arts in the field of public policy with a concentration in gerontology—**  
**Prerequisite:** a bachelor's degree with a B average (or equivalent) from an accredited college or university. In some cases, the applicant may be requested to take the Graduate Record Examination. Previous experience in gerontology is not essential; a variety of academic and experiential backgrounds are acceptable.

**Required:** the general requirements stated under the Graduate School of Arts and Sciences, including 42 semester hours of course work. There is no thesis requirement. Core courses required for all students: Econ 217; PSc 203; Stat 104 or 111, and 183 (Stat 129 or Psc 244 may be substituted for Stat 183); Gern 201, 205, 290; Soc 254 (PSc 204 may be substituted for Soc 254), 280; Educ 344; and HSA 235. The remaining three courses are electives. All students are required to pass a Master's Comprehensive Examination.

**201 The Biology of Aging (3)**

The processes of aging in the various systems of the human body; principal illness patterns in the elderly; theories of the aging process. (Fall) Kenney

**205 Public Policy and Aging (3)**

The "political economy" of aging in our society. Political and governmental processes as they influence and are influenced by older persons; the impact of demographic trends and retirement patterns on the economic system. (Fall) Morrison

**290 Practicum in Gerontology (3)**

Field experience in an agency involved in the planning and evaluation of services for the elderly. Morrison

**GREEK**

See **Classics**.

**HEALTH SERVICES ADMINISTRATION**

Professors K.J. Darr, P.N. Reeves, P.S. Birnbaum, R.G. Shouldice, J. Ott, R.F. Southby  
 (Chair), L.G. Pawlson, M.H. Firestone, R. Riegelman, M.J. Shaffer  
 Professorial Lecturer H.L. Hirsh

Associate Professors D.L. Infeld, W. Greenberg, D.L. Zalkind, G.E. Crum, S.R. Eastaugh  
 Associate Professorial Lecturers C.P. McKelvey, D.P. Andrulis, J.C. Wilmot, D.S. Good, J.  
 Rodgers, J. Falek, C.B. Jacobina

Assistant Professorial Lecturers Z.F. Acevedo, N. Singpurwalla



See the School of Government and Business Administration for programs of study leading to the degrees of Master of Health Services Administration,\* Specialist in Health Services Administration, and Doctor of Philosophy.

### Second Group

- 142 **Financial Management in Health Care Institutions** (3) Staff  
Consideration of the nature, analysis, and interpretation of accounting data. Cost accounting, budgeting, and internal control techniques; emphasis on their use in the management planning and control process. (Spring)
- 153 **Survey of Health Care Organization** (3) Staff  
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall)
- 154 **Introduction to Hospital Management and Procedures** (3) Staff  
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and the functions of the department manager. Prerequisite: HSA 153 or permission of instructor. (Spring)
- 170 **Quantitative Methods in Health Care Administration** (3) Staff  
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise, and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than on manipulating predeveloped formulas. (Fall)
- 190 **Special Topics in Health Care Administration** (3) Staff  
Experimental offering at the undergraduate level. (Fall and spring)

### Third Group

- 202 **Introduction to Health and Medical Care** (3) Crum  
Examination of concepts of health and disease from physical and philosophical perspectives. Description and analyses of various components of the health care system, including medical technology and the health professions. (Fall and spring)
- 203 **Organization and Management of Health Services** (3) Shouldice  
Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)
- 206 **Quantitative Methods in Health Services Operations** (3) Zalkind, Cohen  
Concepts and applications of statistical methods in health services operations. Probabilistic reasoning and statistical methodology. Sampling and study design. Critiques of statistical studies and reporting. Prerequisite: Stat 51 or equivalent or permission of instructor; the statistics course must be passed with a grade of B or better within two years prior to enrolling in HSA 206. (Fall and spring)
- 207 **Health Services Information Applications** (3) Zalkind, Infeld  
Introductory survey of health information systems. Decision-making needs; collection, analysis, and reporting of data. Principles of managing the acquisition and development of health services information systems. Prerequisite: HSA 206 and knowledge of microcomputer spreadsheet or database software. (Fall and spring)
- 210 **Health Economics** (3) Greenberg  
Economics of the health care sector. An economic analysis of public policy alternatives in the health industry. Roles of the physician, hospital, insurance, and other health care markets are examined. Prerequisite: Econ 217 or equivalent. (Fall and spring)

\* Accredited by the Accrediting Commission on Education for Health Services Administration



- 211 **Health Finance** (3) Eastaugh  
An introductory course designed to provide a balance between theoretical and practical approaches to the financial management of health care institutions, with emphasis on hospital examples. Specific attention is given to rate regulation, hospital reimbursement, hospital accounting, financial ratio analysis, financial feasibility studies, and strategic marketing. Prerequisite: Accy 201 or equivalent and HSA 210. (Fall and spring)
- 212 **Introduction to Health Services Planning** (3) Reeves, Crum  
Survey of community and institutional health systems planning and evaluation. Introduction to policy planning, strategic planning, project planning, marketing, and evaluation as they apply to health services. (Fall and spring)
- 215 **Health Services and the Law** (3) Firestone  
The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships (e.g., torts, contracts, and insurance) of facilities, physicians, personnel, and patients. Personnel administration; legal aspects of labor relations; trends in health services delivery law. (Fall and spring)
- 221 **Health Systems Strategic Planning** (3) Reeves  
Application of strategic planning concepts to health services. Study of the strategic planning process as a series of interrelated analyses and decisions, including representative analytic methods used in the most critical stages. Discussion of the relationships among strategic planning, project planning, marketing, and financial planning. (Fall and spring)
- 223 **Policy in Strategic Health Services Planning** (3) Reeves  
Effects of legal, political, social, governmental, and economic factors in strategic health planning. Emphasis on formulation, analysis, and implementation of state, local, and institutional health policies. The role of these policies as expressions of values that serve as guiding forces in the strategic planning process. (Summer)
- 225 **Developing National Health Services Policy** (3) Southby  
Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Spring)
- 227 **Seminar: Ethics in Health Services Administration** (3) Darr  
Managerial implications of ethical issues in medical and health services delivery: administrative and institutional ethics; professional codes; decisions concerning impaired professionals, dying patients, fertility control, experimentation, and new technology; resource allocation. (Spring)
- 231 **Managing the Short-Term Hospital** (3) Darr  
Organization and management of the acute care hospital—administration, governance, and medical staff. Relationships of hospital clinical, support, and administrative departments. Analyses of procedures and systems. Administrative ethics. Requirements of the Joint Commission on Accreditation of Health Care Organizations. Prerequisite: HSA 203 and Mgt 210, or permission of instructor. (Fall and spring)
- 233 **Delivery of Mental Health Services** (3) Andrulis  
Study of the organizations and systems for delivery of mental health services; emphasis on managing and financing treatment and rehabilitation facilities. (Summer)
- 236 **Introduction to Long-Term Care Administration** (3) Infeld  
An overview of the field of long-term care and its evolution within the health care and social service systems. The "continuum" of long-term care services, both in institutions and in the community, funding sources for these services, and policy issues involved in delivery of services. Site visits to long-term care programs. (Fall and spring)
- 237 **Managing the Long-Term Care Institution** (3) Infeld and Staff  
Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty



- treatment. Emphasis on personal and professional skills necessary to provide a wide range of services and quality care in these environments. (Summer)
- 238 **Ambulatory Health Services Management** (3) Shouldice  
Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of group practice of medicine as part of a total system of services delivery. (Spring and Summer)
- 239 **Management of Health Maintenance Organizations** (3) Shouldice  
Principles and fundamentals of prepaid group practice and health maintenance organizations and other alternative financing/delivery mechanisms. Emphasis on planning, development, and operation of HMOs and CMPs, including discussion of models, financial issues, consumers, and providers of care. (Fall and summer)
- 245 **Case Studies in Health Services Administration** (3) Southby, Birnbaum, Infeld  
Intensive qualitative and quantitative analyses of major problem areas in health system administration and planning, using the case study method. Cases cover the broad spectrum of health policy, planning, and management of the health services system. Serves as a capstone course for health services students. (Fall and spring)
- 252 **Comparative Health Services Systems** (3) Southby  
Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and the significance of systems to the health status of a nation. (Spring)
- 255 **Issues in Gerontology** (3) Infeld  
Interdisciplinary seminar on the nature and problems of aging, including demographic, biological, psychological, social, economic, environmental, and political perspectives on the status and needs of the older population. Theory and research; service delivery; attitudes and behaviors based on contact with older persons. (Fall)
- 257 **Advanced Health Resources Management** (3) Eastaugh  
Methods, techniques, and policies used in health resources management. Prospective rate regulation under DRGs, capital investment decisions, buy-lease decisions, financial feasibility studies, cost accounting, multihospital systems management, and strategic financial planning. Financial management of HMOs, teaching programs, nursing homes, hospices, and home health care programs. Prerequisite: HSA 211. (Fall and spring)
- 260 **Administration of Health Systems** (3) Crum  
Same as PubH 213. See the School of Medicine and Health Sciences Bulletin.
- 262 **Economics of Health Care** (3) Greenberg  
Same as PubH 211. See the School of Medicine and Health Sciences Bulletin.
- 263 **Health Services Financial Management** (3) Staff  
Same as PubH 263. See the School of Medicine and Health Sciences Bulletin.
- 264 **Health Planning and Marketing** (3) Reeves  
Same as PubH 214. See the School of Medicine and Health Sciences Bulletin.
- 265 **Health Law** (3) Staff  
Same as PubH 265. See the School of Medicine and Health Sciences Bulletin.
- 268 **Case Studies in Administrative Medicine** (3) Crum  
Same as PubH 296. See the School of Medicine and Health Sciences Bulletin.
- 270 **Research in Health Services Administration** (3) Southby  
Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)
- 271 **Field Problem Studies in Health Services Administration** (3) Good  
Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)



- 273- **Residency I** (3-3-3) Staff  
 74-75 Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects as required. (Fall and spring)  
 276- **Residency II** (3-3-3) Staff  
 77-78 For students who take additional residency experience. (Fall or spring)  
 285-86 **Readings in Health Services Administration** (3-3) Southby and Staff  
 Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)  
 290 **Special Topics in Health Services Administration** (3) Staff  
 Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)  
 299-300 **Thesis Research** (3-3) Southby  
 (Fall and spring)

#### Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

- 310 **Health Resources Allocation Policies** (3) Southby, Greenberg  
 Study of major contemporary issues in health policy and health economics. Development and critique of policies designed to deal with current health issues. (Spring)  
 311 **Seminar: Public-Private Sector Institutions and Relationships** (3) Staff  
 An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.  
 330 **Health Services Delivery Policy** (3) Infield  
 Study of major contemporary issues in health services delivery. Development and critique of policies designed to deal with those issues. For doctoral and Specialist students; to be taken toward the end of course work for the degree. (Fall)  
 398 **Advanced Reading and Research** (arr.) Staff  
 Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring)  
 399 **Dissertation Research** (arr.) Staff  
 Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

#### HEBREW

See Classics.

#### HISTORY

University Professor M.F. Cunliffe  
 Professors H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer, P.F. Klarén, R.E. Kennedy, Jr., W.H. Becker (Chair), L.P. Ribuffo  
 Professorial Lecturers S. Shaloff, D.C. Allard, J. Schlight, M. Bohachevsky-Chomiak, M. Khadduri  
 Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, J.O. Horton, E. Berkowitz, M.A. Atkin  
 Assistant Professor D.J. Schroeter (Visiting)  
 Director and Principal Investigator of the First Federal Congress Project C. Bickford



*Bachelor of Arts with a major in history*—The following requirements must be fulfilled:

1. Majors must meet the general requirements of Columbian College, selecting specific courses in consultation with either a departmental or college advisor. For the foreign language or culture requirement, majors must meet the foreign language, rather than foreign culture, requirement.

2. Majors must either take or waive the introductory courses: Hist 39–40, 71–72. Waiver may be accomplished by passing a departmental examination, which is held the day before registration. Credit as well as waiver may be obtained also by departmental examination, or by scoring above 600 on College Board Achievement Tests, or by scoring 4 or 5 on Advanced Placement Examinations. Neither waiver nor credit is awarded by CLEP examination.

3. Distributed courses within the major must include (for a total of 27 semester hours):

(a) Hist 199 (proseminar);

(b) two seminars, one of which must be a research seminar;

(c) two 100-level courses in each of the following three fields:

(1) Europe—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 158, 183;

(2) United States—Hist 117, 118, 126, 128, 129, 133, 134, 137, 138, 167, 168, 169, 170, 171; 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 185, 186, 197;

(3) Russia, Asia, Africa, and Latin America—Hist 107, 108, 116, 119, 120, 135, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

Special topics courses numbered 198 and courses in the 700 Series may also satisfy one of the three field requirements. Majors should check with the major advisor on the applicability of such courses.

For Special Honors in history, a history major must meet the general honors requirements listed under Regulations. In addition, the Department requires candidates to apply for the special honors program before the end of the first semester of the junior year. During that semester, candidates for the program must receive a grade of A in a 3-hour research seminar, taken preferably with the professor who will advise the senior thesis. Candidates admitted to the program will subsequently enroll in the research seminar, Hist 191, and complete a senior honors thesis in Hist 192 during their last semester. Only if the thesis merits the grade of A will Special Honors be recommended.

*Minor in history*—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the beginning of their senior year. Such students may choose a nonspecialized history curriculum, or may concentrate in one area, such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field, such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental requirements for a minor, the student must complete at least 15 semester hours in approved courses with a grade of C or above. One 3-semester-hour seminar must be included in the program.

*Master of Arts in the field of history*—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of either a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300, Thesis Research, and at least three other third-group courses, or a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (6 semester hours) and four readings/research seminars. Exceptions to the minimum for third-group courses can be granted only by the department's Graduate Programs Committee. Hist 201 is required of candidates who have not previously had a course in historiography and historical method. A maximum of 6 semester hours may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must



arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

*Master of Arts in the field of history with a concentration in historic preservation*—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may also be required to pass an examination in measured architectural drawing.

*Master of Arts in the field of history with a concentration in public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour program emphasizes the study of history as it relates to the analysis and conduct of public policy. Hist 213-14 and internship required. Additional course work is to be chosen with advisor's approval.

*Doctor of Philosophy in the field of history*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the passing of a written examination in two appropriate foreign languages or in one foreign language and an approved subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. One of the special fields may be taken as a "write-off," as long as it is not in the area in which the candidate plans to write the dissertation. The major fields include the following: early modern Europe, modern Europe, United States, Latin America, modern Near East, modern East Asia, and modern Russia and the Soviet Union. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, classical and medieval Europe, Tudor and Stuart England, etc.). A student may elect one special field outside the History Department if it is relevant to the program. Students having a special field in historic preservation may be required to pass an examination in measured architectural drawing. In the final 24 hours of course work for the General Examination, except in preparation for the "write-off" examination, the candidate may enroll only in third-group courses. Any exception requires the approval of the Graduate Programs Committee.

*Doctor of Philosophy in the field of American Religious History* (offered in cooperation with the Department of Religion)—Required: the general requirements stated under the Graduate School of Arts and Sciences and the specific requirements of the Doctor of Philosophy in the field of history, stated above. The General Examination must cover four fields, including two from the Department of History (generally American social history and one other) and two from the Department of Religion (history of religion in America and one other field in religious history).

**Waiver Examinations:** Waiver examinations are given three times per year, on the day preceding registration in the fall and spring semesters and the first summer session.

**Course Accessibility:** All second-group courses are open to students without history course prerequisites with the exception of Hist 135, 157, and 199.

#### First Group

##### 39-40 European Civilization in Its World Context (3-3)

Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: From 1715 to the present. (Academic year)

##### 50 Washington, D.C.:

History, Culture, and Politics (3)

Same as AmCv/PSc/U&RP 50.

Gillette and Interdisciplinary Team

Staff



- 71-72 **Introduction to American History** (3-3) Staff  
 Hist 71: political, social, economic, and cultural forces of the United States, in world perspective, from the earliest settlements to 1876. Hist 72: from 1876 to present. (Academic year)

### Second Group

- 101 **The European Revolutionary Tradition, 1640-1917** (3) Kennedy  
 A comparative study of the English, French, and Russian revolutions with focus on theories of revolution, revolutionary ideology, millenarianism, and the revolutionary legacy inherited by third-world movements. (Fall)
- 105-6 **History and Philosophy of Natural Science** (3-3) Schlager  
 A history of the natural sciences and their implied cosmologies. Emphasis on empirical discoveries and modes of explanation, changing conceptual frameworks and methodologies, and philosophical implications. Hist 105: Early natural philosophy to the rise of modern science. Hist 106: Developments in the physical and biological sciences from the 19th century to the present.
- 107 **The Ancient Near East and Egypt to 322 B.C.** (3) Hadley  
 Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.
- 108 **Greece and the Near East, 359 B.C. to the Second Century A.D.** (3) Hadley  
 Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.
- 109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley  
 Neolithic background; Bronze Age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)
- 110 **The Roman World to 337 A.D.** (3) Hadley  
 Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)
- 111-12 **Medieval History** (3-3) Andrews  
 Hist 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D.; Byzantium and Islam at their apogee. Hist 112: Medieval European daily life, institutions, and creative movements to about 1400; the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)
- 116 **History of Africa** (3) Shaloff  
 Survey of political, cultural, and economic development from ancient times to the present. (Spring)
- 117 **Crisis or Conspiracy? A History of the International Politics of Oil** (3) Becker  
 The history of the international politics of oil, with special attention to developing relationships between major oil companies and governments here and abroad. (Summer)
- 118 **History of North Africa** (3) Schroeter  
 A study of the Maghreb from the 15th to the 20th century. (Spring)
- 119 **China in the 20th Century: Reform and Revolution** (3) Johnson  
 Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)
- 121 **The Renaissance in Western Europe** (3) Schworer  
 Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)
- 122 **The Reformation in Western Europe** (3) Herber  
 Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)



- 123 **European Intellectual History I** (3) Kennedy  
Popular culture; religion and science in the 17th century; the Enlightenment; Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Diderot, Condorcet on religion, history, nature, society, and politics; the intellectual origins of the French Revolution. (Fall, even years)
- 124 **European Intellectual History II** (3) Kennedy  
Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psychoanalysis; Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)
- 125 **Women in European History** (3) Schwoerer  
A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)
- 128-29 **War and Society** (3-3) Allard  
How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil-military relations, the development of strategic thought, and the naval and military influence Britain and America have exerted on each other. Hist 128: 1776-1918. Hist 129: 1919-present. (Academic year)
- 131-32 **History of Germany** (3-3) Herber  
Political, social, and cultural development. Hist 131: From mid-17th century to Bismarck. Hist 132: From William II to the present. (Academic year)
- 133 **Recent U.S. History, 1890-1941** (3) Ribuffo  
Political, social, diplomatic, and intellectual developments, with particular emphasis on the "searching" '20s and New Deal. (Fall)
- 134 **Contemporary U.S. History Since 1941** (3) Ribuffo  
Political, social, diplomatic, and intellectual developments, with particular emphasis on the Cold War, "silent" '50s, and disrupted '60s. (Spring)
- 135 **History of Soviet Intelligence Services** (3) Dziak  
The role and impact of intelligence and security operations in Soviet domestic and foreign policy, from 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents; Lenin, the Cheka, and the formative years; operations under Stalin; problems of the post-Stalin years; and operations in the Brezhnev era. Prerequisite: Hist 146 or PSc 131 or 168, or permission of instructor.
- 136 **Europe in the 20th Century** (3) Sachar  
Diplomatic, political, and cultural developments from the turn of the century to the present. (Spring)
- 137 **U.S.-Soviet Strategic Relations Since World War II** (3) Thornton  
Survey of U.S.-Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)
- 138 **American Foreign Economic Policy in Historical Perspective** (3) Becker  
Historical evolution of United States international economic relations, major issues of foreign economic policy, political problems in policy-making. Emphasis on period since 1945. (Spring)
- 139-40 **World History in the 20th Century** (3-3) Sachar  
Diplomatic, political, and cultural factors. Hist 139: From the turn of the century to the Munich settlement of 1938. Hist 140: From the Munich settlement to the present. (Academic year)
- 141 **History of France I** (3) Kennedy  
Old Regime; Louis XIV, demography, peasants, bourgeois, nobles; Church-Protestant-Jewish relations; salons, Enlightenment, and philosophes; literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)
- 142 **History of France II** (3) Kennedy  
The Revolutionary tradition and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; deChristianization.



- Catholic integralism, and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)
- 145 **Russia to 1801** (3) Atkin  
Survey of Russian history from the rise of the Kievan confederation in the ninth century to the establishment of Imperial Russia as a European great power. Attention will be given to the political, socioeconomic, and cultural history of the East Slavs, especially the Russians. (Fall)
- 146 **Russia and the Soviet Union from 1801 to the Contemporary Era** (3) Atkin  
Survey of Russian and Soviet history from the reign of Alexander I to the post-Stalin era. Attention will be given to the contending forces of revolution, reform, and conservatism; diplomatic relations; economic development; and social change. (Spring)
- 148 **The French Revolution** (3) Kennedy  
Social, political, economic, and cultural history of the decade of revolution, 1789-1799. Attention to its structural consequences in France and in Europe at large. (Summer)
- 149-50 **European Diplomatic History** (3-3) Staff  
Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: Since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)
- 151-52 **History of England** (3-3) Kenny  
Development of English civilization and its impact on Western culture. Hist 151: To 1689. Hist 152: Since 1689. (Academic year)
- 153 **Tudor England** (3) Kenny  
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603. (Fall)
- 154 **Stuart England** (3) Schwoerer  
The civil wars, Restoration, and Glorious Revolution. Political, religious, socioeconomic, and intellectual developments in England, 1603-1714. (Spring)
- 155 **History of Modern Ireland** (3) Kenny  
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.
- 156 **Jewish History from 70 A.D. to 1648** (3) Schroeter  
A history of the Jewish people from the destruction of the Temple through the rabbinic and medieval period, with emphasis on contacts with Christian and Muslim communities and cultures. (Fall)
- 157 **20th-Century European Diplomatic History** (3) Sachar  
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)
- 158 **Modern Jewish History** (3) Sachar  
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)
- 161 **Revolution in 20th-Century Latin America** (3) Klarén  
Examination of the major social revolutions in modern Latin America, especially in Mexico, Cuba, Nicaragua, and Central America; their origins, social composition, leadership, ideology, and programs. (Fall)
- 162 **20th-Century Latin America** (3) Klarén  
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, nationalism, Marxism, the military dictatorship, and the development process. (Spring)
- 163-64 **History of Latin America** (3-3) Klarén  
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: A problems approach to Latin America, 1820 to the present;



- thematic emphasis on neocolonialism, corporatism, liberalism, caudillismo, modernization, populism, and revolution. (Academic year)
- 165 **Latin America and the Industrializing World, 1850-present** (3) Klaren  
Examination of the political/diplomatic responses of Latin American nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries, particularly to the United States. (Fall) Gillette
- 167 **Themes in U.S. Cultural History** (3)  
Same as AmCv 167.
- 169 **The American Revolution** (3) DePauw  
The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Fall) Hill
- 170 **U.S. Early National History** (3)  
Political, diplomatic, economic, and social history of the early republic, 1787-1828. (Fall) Horton
- 171-72 **U.S. Social History** (3-3)  
Hist 171: Daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607-1861. Hist 172: The urban-industrial era from 1861 to present. Same as AmCv 171-72. (Academic year) Horton
- 173 **Afro-American History** (3)  
Survey of the Afro-American experience, emphasizing the contributions of black Americans to and their impact upon American history. (Fall) Horton
- 174 **Special Topics in Afro-American History** (3)  
Concentration on specific issues central to the Afro-American experience. Consult Schedule of Classes for issues to be addressed. (Spring) Horton
- 177 **The Jacksonian Era and the Rise of Mass Politics** (3)  
The period 1828-1860 and its continuing significance to American society; emphasis on racial and gender divisions and changes in the legal and political systems. (Fall, alternate years) Berkowitz
- 178 **Making and Braking the Welfare State** (3)  
An examination of America's changing approaches to health and welfare problems, explaining the origins of modern entitlement programs and examining ways in which these programs have been adapted and reshaped. Topics such as welfare reform and health insurance are covered. (Spring) Berkowitz
- 179 **U.S. Economic History** (3)  
Survey of American economic history from colonial times to the present. Particular attention is given to the economics of slavery, the development of a national industrial economy, and the growth of the federal government as an influence on economic policy. Same as Econ 179. (Fall) Hill
- 181-82 **U.S. Diplomatic History** (3-3)  
American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year) Kennedy
- 183 **Individualism, Reason, and Tradition in Early Modern Europe** (3)  
An interdisciplinary examination of the rise of Western individualism from the Renaissance to the American and French Revolutions. Analysis of the tension between reason and religious and popular traditions. Guest lectures by Art, English, Germanic Languages and Literatures, and History faculty. Core course for Early Modern European Studies major but open to other undergraduate and graduate students as well. Same as Engl/Fren/Ger/Rel 183 and Art 187. (Spring) DePauw
- 184 **Civil War and Reconstruction** (3)  
How tensions between the sections developed into violence, how a total war was fought on American soil, and how the experience of war affected the generation that lived through it. (Spring, alternate years) DePauw
- 185 **History of Women in America** (3)  
Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have



- affected and been affected by the female half of the population. Same as AmCv 185. (Spring, alternate years)
- 186 **U.S. Urban History** (3) Gillette  
The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)
- 187 **History of Modern China** (3) Johnson  
China since 1840, with particular attention to political developments. (Fall)
- 188 **History of Chinese Communism** (3) Thornton  
Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)
- 189 **History of Modern Japan** (3) Staff  
Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)
- 190 **Ethnohistory** (3) Wagner, Humphrey  
Same as Anth 190.
- 191-92 **Senior Honors Thesis** (3-3) Herber  
Required of and open only to undergraduate honors candidates in history. (Academic year)
- 193 **History of the Near East** (3) Khadduri  
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)
- 194 **History of the Modern Near East** (3) Khadduri  
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall, odd years)
- 195 **Traditional Civilizations of China and Japan** (3) Johnson  
Intellectual, institutional, and social development of the traditional civilizations of China and Japan, from their origins to 1800. (Fall)
- 196 **The Modern Transformation of China and Japan** (3) Johnson  
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)
- 197 **Oral History and Interview Techniques** (3) Staff  
Same as AmCv/Anth 197.
- 198 **Special Topics in History** (3) Staff  
Historical perspectives on great issues of past and present. New topic each semester.
- 199 **Proseminar: Readings for the History Major** (3) Staff  
Required of history majors; this course should be taken during the junior year. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

### Third Group

Any student who has had the appropriate preparation may, with the consent of the instructor, enroll in a third-group course. Enrollment is not restricted to history majors and graduate students. History majors will satisfy the third-group requirement by taking either two courses for research or one course for research and one course for a readings program.

- 201 **History and Historians** (3) Staff  
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)



- 203-4 **Seminar: Research or Readings (3-3)**  
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year) Staff
- 205 **Readings Seminar: Eastern European History, 1772-1918 (3)**  
Eastern Europe from the partitions of Poland to the end of World War I. Staff (Fall)
- 206 **Readings Seminar: Eastern European History, 1919-1945 (3)**  
Emergence of modern East European states after World War I. Developments of the interwar period and World War II. (Spring) Staff
- 209 **Readings/Research Seminar: Topics in Ancient History (3)**  
Readings on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit. Hadley
- 213-14 **History in Public Policy (3-3)**  
Seminar in the use of historical insights and methods in policy-making, with emphasis on domestic issues. Assessment and use of primary sources for policy analysis and the use of historical analogy in policy formulation. Berkowitz
- 217 **Readings/Research Seminar: Russian and Soviet Thought (3)**  
Selected topics in the intellectual, social, and cultural history of 19th- and 20th-century Russia and Soviet Union. Atkin
- 218 **Readings/Research Seminar: Soviet Nationalities (3)**  
An examination of the relationship between the U.S.S.R.'s multinational composition and its domestic political, economic, social, and cultural policies and foreign relations. (Fall) Atkin
- 219 **Internship in History and Public Policy (3 or 6)**  
Supervised participation in an office or agency concerned with the formulation of public policy; terms of the internship are arranged with the Director of the History and Public Policy Program. Enrollment restricted to students in the History and Public Policy Program. (Fall and spring) Berkowitz
- 220 **American Business History (3)**  
The history of American business institutions in manufacturing, distribution, transportation, and finance. Particular attention will be given to the period since industrialization, with consideration of business institutions in their economic, legal, governmental, and social contexts. Same as BAAd 293. (Spring) Becker
- 224 **Readings/Research Seminar: European Intellectual History (3)**  
Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life. Kennedy
- 225 **History of Washington, D.C. (3)**  
Same as AmCv 225. Gillette
- 228 **Readings/Research Seminar: Modern Military and Naval History (3)**  
Discussion, readings, and research in 20th-century European and American military and naval history. Staff
- 229 **Seminar: World War II (3)**  
Examination of statecraft and the management of force before, during, and after World War II. Special attention to broad aspects of military policy and strategy and their interaction with international politics and diplomacy. Staff
- 230-31 **Readings/Research Seminar: Strategy and Policy (3-3)**  
Hist 230: A study of the historical development of strategy and the relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year) Schligh
- 232 **Comparative Communist Systems I (3)**  
Same as PSc 232. Wolchik
- 233 **Comparative Communist Systems II (3)**  
Same as PSc 233. Wolchik
- 237 **Readings Seminar: Soviet Foreign Policy, 1917-1964 (3)**  
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful coexistence" and detente. (Fall and summer) Staff



- 239 **Readings/Research Seminar: Early Modern European History** (3) Schwoerer  
Topics selected from Western European history of the 14th through 17th centuries. Readings or research, depending upon students' interests and curricular needs.
- 241 **Readings/Research Seminar: Modern European History** (3) Herber  
Prerequisite: appropriate preparation and consent of instructor
- 246 **Readings/Research Seminar: History of Modern Russia and Soviet Union** (3) Atkin  
Selected topics in the domestic history of modern Russia and Soviet Union. Readings or research, depending upon students' interests and curricular needs. (Fall)
- 248 **Readings Seminar: Modern Near Eastern History** (3) Staff  
Admission by permission of instructor. (Spring)
- 249 **Research Seminar: European Diplomatic History** (3) Staff  
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th century. Reading knowledge of one language other than English required. (Fall)
- 250 **Readings Seminar: Issues and Topics in Jewish History** (3) Schroeter  
Topics to be announced in the *Schedule of Classes*. (Spring)
- 251 **Readings/Research Seminar: English People and Institutions** (3) Kenny, Schwoerer  
Selected topics in the political, social, intellectual, and economic history of England. Focus upon one time period and special area of interest.
- 253-54 **Readings Seminar: History of Sino-Soviet Relations** (3-3) Thornton  
Seminar designed to develop analytic and historiographic skills. Fall: turn of the century to 1949; spring: Korean War to the present. (Alternate academic years)
- 255-56 **Readings Seminar: U.S.-Soviet Strategic Relations Since World War II** (3-3) Thornton  
Seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations. Fall: World War II to 1965; spring: 1965 to the present. Hist 255 is prerequisite to Hist 256. (Academic year)
- 258 **Communist Party of the Soviet Union** (3) Sodaro  
Same as PSc 258.
- 259-60 **Research Seminar: Problems in U.S.-Soviet-Chinese Relations** (3-3) Thornton  
Development of scholarly skills through preparation of a research paper. Prerequisite: Hist 254 or 255 or permission of instructor. (Alternate academic years)
- 261-62 **Readings/Research Seminar: Topics in Modern Latin America** (3-3) Klarén  
Admission by permission of the instructor.
- 271-72 **U.S. Social History** (3-3) Horton  
Hist 271: Readings seminar on American daily life, institutions, and intellectual and artistic achievements. Hist 272: Research seminar. Hist 271 is prerequisite to Hist 272.
- 275-76 **Readings/Research Seminar: U.S. Political and Colonial History** (3-3) Staff  
Research or readings, depending on students' interest and curricular needs. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year)
- 277-78 **Historic Preservation: Principals and Methods** (3-3) Longstreth  
Same as AmCv/U&RP 277-78.
- 279 **Readings/Research Seminar: American History** (3) Hill  
Readings or research, depending on students' interests and curricular needs. Admission by permission of instructor. (Summer)



- 281-82 **Readings/Research Seminar: U.S. Diplomatic History** (3-3) Hill  
Research or readings, depending on students' interest and curricular needs. Hist  
281: 1776-1890; Hist 282: 1890-1950. (Academic year)
- 283-84 **Readings/Research Seminar: Recent U.S. History** (3-3) Ribuffo  
Prerequisite: 6 semester hours of 100-level American history courses. Research or  
readings, depending on students' interests and curricular needs.
- 285 **Readings Seminar: Military and Women's History** (3) DePauw  
Admission by permission of instructor. (Fall, alternate years)
- 286 **Research Seminar: Military and Women's History** (3) DePauw  
Admission by permission of instructor. (Spring, alternate years)
- 287 **Seminar: Problems in Latin American Civilization** (3) Staff  
Same as IAff 287.
- 289 **Readings/Research Seminar: Modern Japanese History** (3) Staff  
Selected topics in modern Japanese history from the Meiji Restoration of 1868 to  
the present. Research or readings depending on students' interests and curricular  
needs. (Spring)
- 290 **Research Seminar: Jews of the Islamic World** (3) Schroeter  
Selected topics in the communal, political, economic, and intellectual history of  
Jews in lands under Muslim sovereignty. (Fall)
- 291 **Readings/Research Seminar: 20th-Century History** (3) Sachar  
Research or readings on selected topics. (Fall)
- 292 **Israel, Zionism, and the Arab World** (3) Sachar  
Research seminar. (Spring)
- 293 **Research Seminar: Modern East Asian History** (3) Johnson  
294 **Research Seminar: The Modern Near East** (3) Davison  
Readings, discussion, and research in selected political, economic, social, cul-  
tural, and international developments in the 19th and 20th centuries concerning  
countries from the Balkans, through Turkey and the Arab countries, to Iran.  
(Spring)
- 295-96 **Readings Seminar: Modern East Asian History** (3-3) Johnson  
297 **Special Topics Seminar** (3) Staff  
Open to doctoral and master's candidates and qualified undergraduates. May be  
repeated for credit. Offered whenever five or more students can be enrolled.
- 298 **Dumbarton Oaks Courses** (arr.)  
Courses offered each year by scholars in residence at Dumbarton Oaks are open to  
qualified graduate and undergraduate students with permission of department  
chairman. Topics will be announced. May be repeated for credit provided the  
topic differs. Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)

#### Fourth Group

Prerequisite to all fourth-group history courses: consent of instructor. Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in the Institute seminar are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301-14. Students wishing to register for these courses should consult the chairman of the History Department.

#### 301-14 Folger Institute Seminars (3 each)

Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff

#### 342 **Readings in Modern European History** (3)

From the French Revolution to the period following World War I. Staff (Spring)



- 398 **Advanced Reading and Research** (arr.) Staff  
 Limited to students preparing for the Doctor of Philosophy general examination.  
 May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
 Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## HUMAN KINETICS AND LEISURE STUDIES

Professors J.L. Breen, D.E. Hawkins, J.E. Snodgrass (Chair), D.C. Paup  
 Professorial Lecturers C.A. Troester, Jr., R. Anzola-Bentancourt, D.L. Edgell, S. Wahab  
 Associate Professorial Lecturer G.H. Moeller  
 Assistant Professor H. Nashman  
 Instructors E.C. Rach, P.A. Sullivan, S.E. Spivack (Visiting)  
 Lecturers C.D. Cox, G.V. Swengros, B.J. Westerman, D.W. Rivenburgh, R.L. Jarvis, R.L. Harrison, S.D. Cook, S.A. Schulman, W.D. Wynegar

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Science in Human Kinetics and Leisure Studies (with specialization in exercise and sport science) and Master of Arts in Education and Human Development (with specialization in exercise science, tourism administration, and individualized programs in human kinetics and leisure studies).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

## EXERCISE AND SPORT ACTIVITIES

### First Group

With the exception of students pursuing undergraduate degrees in the School of Education and Human Development, credit for exercise and sport activities courses is not recognized for the baccalaureate. Some exercise and sport activities courses may be repeated for credit by those students who are eligible to receive credit for such courses.

- |   |       |
|---|-------|
| 10 <b>Beginning Badminton</b> (1)   | Breen |
| 20 <b>Beginning/Intermediate Golf</b> (1)   | Staff |
| 21 <b>Foil Fencing</b> (1)  | Staff |
| 22 <b>Basketball</b> (1)  | Staff |
| 24 <b>Volleyball</b> (1)  | Staff |
| 26 <b>Karate</b> (1)  | Staff |
| 27 <b>Tennis</b> (1)  | Staff |
| 29 <b>Yoga</b> (1)  | Staff |
| 30 <b>Fitness</b> (1)   | Staff |
| 32 <b>Beginning Swimming</b> (1)  | Staff |
| 33 <b>Swimming/Life Saving</b> (1)  | Staff |
| 34 <b>Intermediate Swimming</b> (1)   | Staff |
| 37 <b>Soccer</b> (1)  | Staff |
| 38 <b>Racquetball</b> (1)   | Staff |
| 42 <b>Aerobics</b> (1)  | Staff |
| 43 <b>Tai Chi</b> (1)   | Staff |
| 45 <b>Experimental Activities</b> (1)   | Staff |
| Topic and amount of laboratory fee (if charged) announced in <i>Schedule of Classes</i> . May be repeated for credit.                       |       |
| 50 <b>CPR and First Aid</b> (2)   | Staff |
| Training for certification in cardiopulmonary resuscitation and first aid. Laboratory fee, amount announced in <i>Schedule of Classes</i> . |       |
| 54 <b>Intermediate/Advanced Tennis</b> (1 or 2)   | Staff |
| Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.  |       |



- 55 **Swimming—Water Safety Instructor Certification** (2) Staff  
 56 **Scuba Diving** (2) Staff  
     Laboratory fee, amount announced in *Schedule of Classes*.  
 59 **Team Sports** (2) Staff  
 60 **Racket Sports** (2) Staff  
 61 **Aquatic Leadership** (2) Staff  
 62 **Conditioning/Weight Training** (2) Staff  
 65 **Skiing** (2) Staff  
     Laboratory fee, amount announced in *Schedule of Classes*. (Spring)  
 68 **Sport Clinics and Workshops** (1 to 3) Staff  
     Special intensive study and skill development. There may be a laboratory fee,  
     amount announced in *Schedule of Classes*.

## HUMAN KINETICS

### Second Group

- 101 **Experimental Course** (3) Staff  
     Topic to be announced in *Schedule of Classes*.  
 103 **Professional Foundations of Human Kinetics and Leisure Studies** (3) Snodgrass  
     Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.  
 109 **Fitness Programs: Testing and Prescription** (3) Staff  
     Evaluation of aerobic capacity, muscular strength, flexibility, and ideal body weight; development of prescribed exercise programs.  
 110 **Fitness Programs: Supervision and Leadership** (3) Staff  
     Concepts and techniques of the supervision and management of fitness programs.  
 111 **Sports Education Technique and Analysis: Racket Sports** (3) Staff  
     Basic concepts in skill development, analysis, and evaluation in the racket sports: badminton, racketball, squash, and tennis.  
 112 **Sports Education Technique and Analysis: Team Sports or Aquatics** (3) Staff  
     Techniques of teaching, coaching, and management of team sports or aquatics.  
 122 **Methods and Materials for Health Education** (3) Staff  
     Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials, and evaluation: basic health knowledge. (Spring)  
 129 **Introduction to Motor Learning** (3) Staff  
     Concepts of skill learning applied to teaching, coaching, and performing motor skills. (Fall)  
 130 **Introduction to Motor Development** (3) Snodgrass  
     Study of the evolution and refinement of fundamental movement skills throughout the life span. (Fall)  
 134 **Sports and Nutrition** (3) Stensland  
     The nutrition needs for recreational exercise and sports; skills in assessing nutrition needs; development of individual nutrition programs that are sport/activity-specific; and identification and correction of nutrition problems affecting sports performance. (Fall)  
 138 **Organization, Administration, and Management of Physical Education, Sports, and Exercise Programs** (3) Staff  
     Curriculum, administration, and management related to physical education, sports, and exercise programs.  
 139 **Principles of Coaching** (3) Sullivan  
     Study of behavioral patterns and interactions related to individual and team sports. (Spring)



- 140 **Exercise and Sport Psychology** (3) Sullivan  
Study of psychological aspects of athletes, teams, and competition in athletics, including personality, motivation, performance level, achievement, and behavioral change strategies; social factors, training events, and measurement techniques. (Fall)
- 145 **Working, Stress, and Human Values** (3) Nashman  
Recognition, prevention, and control of stress and the burnout syndrome. A humanistic inquiry into values, attitudes, and stressors associated with various professions. Admission by permission of instructor. (Fall)
- 146 **Stress Management, Burnout, and Human Potential** (3) Nashman  
The nature, prevention, and control of the stress and burnout syndrome. Students will design an overall stress management strategy that incorporates achievement of life goals and human potential in a stress-efficient manner. Admission by permission of instructor. (Spring)
- 150 **Introduction to Human Anatomy** (3) Staff  
Systematic study of the structure of the human body, with emphasis on joints, muscles, and neuromuscular mechanisms. (Fall)
- 151 **Kinesiology** (3) Paup  
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)
- 152 **Physiology of Exercise** (3) Paup  
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)
- 158 **Safety: Prevention and Care of Sports Injuries** (3) Staff  
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.
- 159 **Athletic Training and Rehabilitation** (3) Rivenburgh, Westerman  
The course is designed to provide lectures and lab sessions dealing with upper and lower extremities for injury evaluation techniques, the use of therapeutic modalities, and rehabilitation techniques. Prerequisite: HmKn 158. (Spring)
- 161-62 **Practicum** (3-3) Paup, Nashman  
Pre-practice teaching or practical experience in related disciplines. May be repeated for credit. (Academic year)
- 171 **Senior Seminar** (3) Snodgrass  
Study of current literature with implications for human kinetics specializations; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HmKn 103 or permission of instructor.
- 172 **International Experiences** (1 to 6) Snodgrass and Staff  
For departmental majors only. Travel to a foreign country for study of a specific topic.
- 173 **Independent Study** (1 to 3) Snodgrass and Staff  
For departmental majors only. Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.
- 175 **Field Experiences/Student Teaching** (3 to 9) Paup, Nashman  
Prerequisite: HmKn 161-62 or equivalent. Admission by permission of instructor. (Fall and spring)
- 184 **Workshop** (1 to 3) Staff  
Topic to be announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

### Third Group

- 201 **Experimental Course** (3) Staff  
Topic to be announced in *Schedule of Classes*.
- 202 **Motor Learning and Performance** (3) Staff  
Variables of perceptual motor learning and performance; theories, concepts, and models of learning applied to teaching and coaching. (Fall)



- 230 **Motor Development and Fitness Over the Life Span** (3) Snodgrass  
Analysis of motor development and fitness throughout the life span, including practice in techniques of critical observation. (Spring)
- 255 **Fitness Evaluation and Exercise Prescription** (3) Paup  
Methods and techniques for providing individualized exercise and fitness prescriptions based on measurement and evaluation of physical fitness and health-related variables. Prerequisite: HmKn 152 or permission of instructor. (Spring)
- 256 **Sports Medicine** (3) Breen  
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries. Prerequisite: HmKn 150.
- 257 **Principles and Concepts of Employee Health/Fitness Programs** (3) Swengros  
General overview of the employee health/fitness movement in the U.S. and other countries. Public and private health policy implications will be analyzed together with national economic and political trends relating to the subject. Evaluation of model programs, procedures, and current practice.
- 259 **Exercise, Stress, and Cardiac Rehabilitation** (3) Gorman  
Applied physiology of exercise and psychological stress in relation to coronary artery disease and myocardial infarction; the principles and practice of rehabilitation of patients recovering from a coronary event (heart attack or heart surgery) by exercise therapy and risk-factor reduction. Prerequisite: HmKn 152 or permission of instructor. (Fall)
- 280 **Advanced Workshop** (1 to 3) Staff  
Topic to be announced in *Schedule of Classes*. Contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)
- 282 **International Experiences** (1 to 6) Staff  
For master's degree candidates enrolled in the department. May be repeated for credit with approval of advisor.
- 283 **Practicum** (3 to 6) Breen and Staff  
Fieldwork, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall, spring, and summer)
- 290 **Advanced Seminar** (1 to 3) Staff  
Topic to be announced in *Schedule of Classes*. May be repeated for credit with approval of advisor. (Fall and spring)
- 293 **Independent Study** (1 to 6) Breen and Staff  
For master's degree candidates enrolled in the department. May be repeated for credit with approval of advisor.
- 297 **Advanced Topical Studies** (3) Breen and Staff  
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. (Fall and spring)
- 299 **Thesis Research** (6) Staff

## TRAVEL AND TOURISM

### Second Group

- 101 **Experimental Course** (3) Staff  
Topics announced in the *Schedule of Classes*.
- 104 **Introduction to Travel and Tourism** (3) Spivack  
Survey of the travel and tourism industry with emphasis on marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism. (Fall, spring, and summer)
- 113-14 **Practicum** (3-3) Hawkins, Rach  
Practical experience in travel and tourism related disciplines. (Academic year and summer)



- 143 **Tourist Accommodations and the Hospitality Industry** (3) Rach  
An overview of the basic principles involved in the management, operations, marketing, and financing of hotels, restaurants, and other tourist accommodations, facilities, and services. (Spring)
- 144 **Tourist Attractions and Activities** (3) Spivack  
Basic principles of planning, developing, and managing natural and man-made attractions. National, state, and local park systems, as well as private sector resorts, theme parks, and other tourist attractions are examined. Various recreation activities popular among tourists are examined in view of their personal, economic, social, and environmental impacts. (Spring)
- 145 **Travel and Tourism Advertising, Public Relations, and Sales Techniques** (3) Staff  
Reviews and applies basic advertising, public relations, and sales techniques to the travel and tourism field. Includes study of effective techniques and selected case studies and current practices. (Spring)
- 146 **Tourist Characteristics and Behavior** (3) Rach  
Socioeconomic, demographic, and psychological characteristics of various types of tourist populations. Emphasis on tourist behavior in planning, developing, and marketing tourism programs and services. Cultural differences as they influence travel. (Fall)
- 147 **Travel and Tourism Transportation Systems** (3) Staff  
Overview of the various transportation modes. Planning, financial, operational, marketing, and evaluation aspects of the different systems of transportation. Limited emphasis on the development of travel distribution systems to support specific transportation modes. (Fall)
- 172 **International Experiences** (1 to 12) Staff  
Travel to a foreign country for study of a specific topic. (Fall, spring, and summer)
- 173 **Independent Study** (1 to 6) Staff  
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit. (Fall, spring, and summer)
- 178 **Designing and Implementing Conferences and Meetings** (3) Rach  
Same as Educ 178. (Spring and summer)
- 184 **Workshop** (1 to 6) Staff  
Topics announced in the *Schedule of Classes*. May be repeated for credit with permission of advisor. (Fall, spring, and summer)
- 193 **Domestic and International Tourism Destinations** (3) Staff  
Physical and cultural geography of major tourist destinations. Guest-host relationships; information systems. (Spring)

### Third Group

- 201 **Experimental Course** (3) Staff  
Topics announced in the *Schedule of Classes*. (Fall, spring, and summer)
- 230 **Organization and Management of Airlines** (3) Staff  
Overview of domestic and international passenger air transportation systems. Analysis of planning, financing, operating, marketing, and evaluating airline transportation systems. Legal and regulatory aspects of airline operation. Attention is devoted to development of infrastructure and related support services. (Summer)
- 249 **Economic, Sociocultural, and Environmental Aspects of Tourism** (3) Hawkins  
Impact of tourism on economic development and cultural values; specific emphasis on psychosocial, physical, and community impacts. (Fall and summer)
- 250 **Administration of Travel and Tourism Services** (3) Staff  
Organization and management concepts, theories, and issues, stressing applica-



- tion of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry. (Spring and summer) Dwyer, Rach
- 260 **Tourism Development** (3)  
Relationship of economic theory and principles to tourism development; applications of financial analysis techniques to the travel and tourism field. (Fall and spring) Edgell
- 261 **Planning for Tourism** (3)  
Integrated planning for travel and tourism organizations; financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall and summer) Anzola-Betancourt, Wahab
- 262 **Tourism Policy Analysis** (3)  
Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Spring and summer) Wynegar, Rach
- 263 **Tourism Marketing** (3)  
Concepts and techniques employed in marketing travel industry products and services, including its public- and private-sector components. Assessment of the tourism product, development of the marketing strategy, preparation of the marketing plan, and analysis of specific promotional programs. (Fall and spring) Moeller, Cook
- 270 **Travel and Tourism Research** (3)  
Analysis of general research methods and tools and their application to the study of travel and tourism. (Spring and summer) Staff
- 280 **Advanced Workshop** (1 to 6)  
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall, spring, and summer) Staff
- 282 **International Experiences** (1 to 12)  
Travel to a foreign country for study of a specific topic. May be repeated for credit with approval of advisor. (Fall, spring, and summer) Staff
- 283 **Practicum** (3 to 6)  
Field work, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall, spring, and summer) Hawkins and Staff
- 290 **Advanced Seminar** (1 to 3)  
May be repeated for credit with approval of advisor. (Fall, spring, and summer) Staff
- 293 **Independent Study** (1 to 6)  
May be repeated for credit with approval of advisor. (Fall, spring, and summer) Staff
- 296 **Systems Analysis of Tourism Services** (3)  
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall and summer) Moeller
- 297 **Advanced Topical Studies** (3)  
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer) Staff
- 299 **Thesis Research** (1 to 6)  
Individual research under guidance of a staff member. May be repeated for credit with approval of advisor. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer)

#### HUMAN RESOURCE DEVELOPMENT

See Human Services.



## HUMAN SERVICES

Professors L. Nadler, C.E. Vontress, L. Winkler, D. Linkowski, E.W. Kelly, Jr., J.C. Heddesheimer (Chair), D.W. Dew (Research)  
 Associate Professors C.H. Hoare, G.E. Schou, N.E. Chalofsky, N.M. Dixon  
 Assistant Professor E. Fabian  
 Instructors T.C. Ginter (Visiting), T. Martin

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Education Specialist, and Doctor of Education.

## COUNSELING

- 133 **Supervised Experience in Counseling** (3 to 6) Staff  
 Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring)
- 162 **Foundations of Counseling** (3) Heddesheimer, Winkler  
 Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)
- 163 **Personal and Social Adjustment** (3) Winkler  
 Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)
- 193-94 **Research and Independent Study** (arr.) Staff  
 Individual research under guidance of a staff member. (Academic year)
- 200 **Special Workshop in Counseling** (arr.)  
 Topics to be announced in the *Schedule of Classes*. May be repeated for credit.
- 251 **Foundations of Counseling** (3) Heddesheimer, Winkler  
 Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)
- 253 **Counseling Interview Skills** (3) Heddesheimer  
 Acquisition of counseling skills common to all theories through lectures, demonstrations by faculty, role playing, and videotaping. Prerequisite: Educ 251 or permission of instructor. (Fall)
- 254 **Personal and Social Adjustment** (3) Winkler  
 Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Spring)
- 255 **Career Development and Information** (3) Vontress  
 A consideration of the theory and practice of career counseling for clients in various age groups. Organizing a career counseling program. Prerequisite: Cnsl 251. (Fall)
- 257 **Individual Appraisal in Counseling** (3) Winkler  
 Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent and Cnsl 251. (Fall)
- 259 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress  
 An introduction to basic counseling and psychotherapeutic theories and associated techniques. Prerequisite: 12 semester hours in counseling, including Cnsl 255 and 257. (Fall and spring)
- 261 **Counseling in Groups** (3) Heddesheimer, Winkler, Linkowski  
 Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. Prerequisite: Cnsl 251. (Spring and summer)
- 263 **Cross-Cultural Counseling** (3) Vontress  
 A consideration of procedures for, and impediments to, counseling culturally different clients. (Spring and summer)
- 267 **Foundations of Employee Assistance Programs** (3) Staff  
 History, legislation, and foundations of practice of counseling in employee assistance programs.



- 269 **Counseling Substance Abusers** (3)  
Individual, group, family, and self-help counseling applied to substance abusers. Staff
- 271 **Family Counseling** (3)  
The family as a system: how it affects the client and how the client affects it. Winkler  
Didactic presentations, role playing, and work with simulated families.  
(Spring)
- 272 **Human Sexuality for Counselors** (3)  
The purpose of this course is to increase the awareness and understanding of sexuality as it relates to counseling in contemporary society. (Fall) Winkler
- 274 **Counseling Older Persons** (3)  
Special considerations and counseling emphases in regard to the life transitions and role changes that occur for older persons. (Summer) Staff
- 276 **Foundations of Rehabilitation** (3)  
Survey of history, philosophy, legislation, roles, and services. Visits to selected field sites. (Fall) Staff
- 278 **Psychosocial Aspects of Disabilities** (3)  
Impact of disabilities and concept of normalization. (Fall) Linkowski
- 280 **Job Development and Placement** (3)  
Job development and modification: placement of disabled persons. (Spring) Staff
- 281 **Medical Aspects of Disabilities** (3)  
Chronic and traumatic disorders with rehabilitation implications. (Fall) Linkowski
- 284 **Practicum in Counseling** (3)  
First half of two-semester clinical experience for degree candidates in counseling. Admission by permission of instructor. Prerequisite: Cnsl 251, 253, 255, 257, and 259. Staff
- 285 **Internship in Counseling** (3)  
Second half of two-semester clinical experience for degree candidates in counseling. Admission by permission of instructor. Prerequisite: Cnsl 284. Staff
- 293-94 **Research and Independent Study** (1 to 3)  
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year) Staff
- 298-99 **Thesis Research** (3-3)  
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. and spring) Staff (Fall)
- 352 **Organization and Administration of Counseling Services** (3)  
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring) Vontress
- 358 **Advanced Theories of Counseling** (3)  
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall) Vontress
- 359-60 **Doctoral Internship in Counseling** (3-3)  
Heddesheimer
- 361 **Seminar: Counseling** (arr.) Staff
- 391 **Dissertation Research** (arr.) Staff  
Preparation of a research outline: research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390.

#### HUMAN RESOURCE DEVELOPMENT

- 133 **Supervised Experience in Human Resource Development** (3 to 6)  
Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring) Staff
- 178 **Designing and Implementing Conferences and Meetings** (3)  
Same as T&T 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference and related conference activities. (Summer) Staff



- 180 **Facilitating Adult Learning** (3) Staff  
Emphasis on developing and/or improving skills in formal instruction, using a wide variety of instructional strategies in adult learning situations. (Summer)
- 193-94 **Research and Independent Study** (arr.) Staff  
Individual research under guidance of a staff member. (Academic year)
- 200 **Special Workshop in Human Resource Development** (arr.) Staff  
Topics to be announced in the *Schedule of Classes*. May be repeated for credit.
- 236 **Technical Programs in Human Resource Development** (3) Staff  
Analysis of the nature and scope of human resource development technical training in industry, government organizations, and labor unions. (Fall)
- 237 **Designing Technical Training Programs** (3) Staff  
Applications of performance-based, criterion-referenced design models for technical skills training programs.
- 239 **International Programs in Adult Learning** (3) Staff  
The use of adult learning programs (adult education, human resource development, higher education, etc.), in various parts of the world, as provided by international agencies, multinational companies, and public foundations. Emphasis on national development, social problems, economic growth. (Spring)
- 263 **Human Resource Development** (3) Chalofsky and Staff  
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall and spring)
- 264 **Design of Training Programs in Human Resource Development** (3) Dixon  
Training, education, and development programs for various client systems will be planned using the critical-events conceptual model. Fieldwork. Prerequisite: HRD 263 and permission of instructor. (Fall and spring)
- 272 **Internship in Adult Learning and Human Resource Development** (3 to 6) Staff  
Supervised experience in selected areas of: human resource development and adult education. Admission by permission of instructor. (Spring)
- 279 **Adult Education** (3) Hoare  
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international.
- 280 **Program Planning in Adult Education** (3) Staff  
Determining educational needs for adults in school and nonschool agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor.
- 281 **Adult Learning** (3) Hoare and Staff  
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical, and social environment in adult education situations. (Fall and summer)
- 282 **Instructional Strategies in Adult Learning Programs** (3) Staff  
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)
- 283 **Interviewing/Counseling for Human Resource Developers** (3) Staff  
Applications of interviewing, coaching, and counseling skills for the human resource development specialist and others in various occupational settings.
- 284 **Evaluation of Adult Learning Programs** (3) Dixon  
Evaluation design strategies for adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)
- 286 **Current Issues in Adult Learning Programs** (3) Chalofsky, Dixon  
Current issues and trends in the fields of adult education and human resource development. (Spring and summer)
- 287 **Management of Adult Learning Programs** (3) Chalofsky  
Program administration in school and nonschool agencies, staff recruitment and



- development, fiscal operations, facilities, and maintenance of effective community relations. (Spring) Chalofsky, Dixon
- 289 **Consultant-Client Relationships in Human Resource Development** (3)  
Examination of the consulting process, consultant-client behaviors, and dilemmas, using theory and field experience for individual and organizational development. Prerequisite: Educ 263, 279; or approval of instructor. (Fall and spring) Staff
- 293-94 **Research and Independent Study** (1 to 3)  
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year) Staff
- 299-300 **Thesis Research** (3-3)  
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. and spring) Staff (Fall)
- 321 **Seminar: Adult Education** (arr.) Chalofsky
- 327 **Seminar: Human Resource Development** (arr.) Chalofsky
- 379 **Practicum in Adult Learning Programs** (3 to 6)  
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring) Staff
- 391 **Dissertation Research** (arr.)  
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390. Linkowski

## HUMAN SERVICES

- 75 **Introduction to Rehabilitation** (3)  
Overview of rehabilitation profession, including philosophy, history, ethics, legislation, settings, and practice. (Fall) Linkowski
- 133 **Supervised Experience in Human Services** (3 to 6)  
Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring) Hoare
- 176 **Program Planning and Development for Service Agencies** (3)  
Examination of program planning and development activities essential to human service agencies. Through case studies and on-site field experiences, students examine and analyze a variety of processes in which agency needs are assessed and programs planned. (Spring) Ferrante, Hoare
- 178 **Psychosocial Aspects of Disabilities** (3)  
(Formerly Educ 363) Linkowski
- 181 **Medical Aspects of Disabilities** (3)  
(Formerly Educ 361) Linkowski
- 182 **Organization and Administration in the Human Services** (3)  
Chronic and traumatic disorders with rehabilitation implications. (Fall) Hoare and Staff
- 193-94 **Research and Independent Study** (arr.)  
Introduction to organizational theory and program administration in non-school agencies, staff recruitment and development, fiscal operations, personnel and program supervision, facilities, and maintenance of effective community relations. (Spring) Staff
- 195 **Seminar in Human Services: Current Issues** (3)  
Individual research under guidance of a staff member. (Academic year) Hoare
- 200 **Special Workshop in Human Services** (arr.)  
Analysis of selected issues in human services. Each student conducts an investigation of an identified problem in human services and completes a skill assessment project. Admission by permission of instructor. (Spring) Staff
- Topics to be announced in the *Schedule of Classes*. May be repeated for credit.



## HUMANITIES

**Humanities Steering Committee**

J.A.A. Plotz (Coordinator), J. Butler, J. Chaves, G. Carter, R.P. Churchill, E.A. Fisher, R.E. Kennedy, N.N. Natov, J.F. Thibault, D.D. Wallace

Columbian College of Arts and Sciences offers a set of interdisciplinary courses designed to provide a coherent introduction to classic works in the humanities. The courses deal with historical figures, creative works of art and literature, systems of philosophy, and religious traditions that are the common property of educated people. The full interpretation of these fundamental sources of Western culture requires the collaboration of faculty from all disciplines of study encompassed in the humanities.

**1 Roots of the Western Tradition (3)**

Staff

Basic ideas of Western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. Some sections are taken in conjunction with Engl 13. (Fall and spring)

**2 Ideas in Western Culture: Aquinas to Locke (3)**

Staff

An examination in historical context of central texts from the Middle Ages, the Renaissance, and the Enlightenment: Aquinas, Dante, Machiavelli, Erasmus, Luther, Montaigne, Bacon, Shakespeare, Rabelais, Descartes, Milton, and Locke. (Fall and spring)

**3-4 Studies in 19th-Century Culture (3-3)**

Staff

Through study of representative works of European and American art, music, literature, drama, philosophy, and theology, students are introduced to major themes of 19th-century culture and are initiated into the methods of analysis and interpretation characteristic of the different disciplines within the humanities. The 19th-century resources of Washington form part of the curriculum. (Academic year)

**5 The 20th-Century Consciousness (3)**

Butler, Soltan

Major themes and paradigms of 20th-century civilization as expressed in key literary and philosophic texts, visual arts, music, and cultural artifacts. Key issues include the meaning of history in the age of two world wars; the Holocaust and the crisis of reason; the authority of science; the decline of Western hegemony; modernism and postmodernism. (Spring)

**43-44 Classical Humanities (3-3)**

Lectures in the origins and development of Western civilization from approximately 3000 B.C. to 1300 A.D. Hmn 43 considers the civilization of the Old Testament period and of Classical Greece through readings in the Old Testament and in Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Plato, and Aristotle. Hmn 44 considers the civilization of the Roman Empire and of medieval Europe through readings in Virgil, Tacitus, St. Augustine, Aquinas, and Dante, and in medieval romance. Offered off campus only.

**45-46 Humanities in the Modern World (3-3)**

Lectures in the development of Western civilization from the 14th to the 20th centuries. Hmn 45 considers Renaissance and Neoclassical culture through readings in Machiavelli, Cellini, Shakespeare, Cervantes, Bacon, Moliere, and Voltaire. Hmn 46 considers aspects of Romanticism and Modernism manifested in works by Goethe, Flaubert, Zola, Nietzsche, Mann, Chekhov, and Joyce. Offered off campus only.

## INDIVIDUAL GRADUATE PROGRAMS

**Committee on Individual Programs**

C.E. Rice (Program Director), A.D. Andrews, B.L. Catron, J.J. Cordes, W.B. Griffith, T.L. Hufford, P.H.M. Lengermann

The Graduate School of Arts and Sciences offers the course listed below primarily for students with individualized interdisciplinary programs of study for the master's degrees.



The Committee on Individual Programs, which has supervisory responsibility for Individual Programs students, provides the faculty for the Colloquium.

### 250 Colloquium on Interdisciplinary Methodologies (3)

Analysis from several perspectives of the problems inherent in interdisciplinary study and research, conditions that justify interdisciplinary work, norms and strategies for success, and case studies. (Offered as the demand warrants)

Staff

## INTERNATIONAL AFFAIRS

The Elliott School of International Affairs offers a multidisciplinary program leading to the degrees of Bachelor of Arts and Master of Arts in the field of international affairs. The program provides students with a broad background in the general areas of international affairs as well as opportunities to specialize in one of the traditional disciplines or in a regional area.

*Bachelor of Arts with a major in international affairs*—The following requirements must be fulfilled.

1. The general requirements stated under the Elliott School of International Affairs.
2. Prerequisite courses—see the Elliott School of International Affairs, Curriculum Requirements.
3. Required courses for the major—Econ 181–82; the third year of study of a foreign language (may be literature courses taught in the language); one course selected from Geog 132, 133, 134, 135, 145, 146, 147, or 154; Hist 182 and one course selected from Hist 136, 150, or 157; PSc 140 and either 142 or 144.
4. Fifteen semester hours of additional course work must be selected from one of the following group options (courses taken in fulfillment of required courses for the major may not be applied to the selected group option).

*International politics*—courses concerned with theory and practice in international affairs, forces shaping the world scene, and U.S. foreign policy, selected from Geog 127, 133, 137, 146, 147; Hist 137, 139–40, 149; PSc 105, 106, 107, 108, 130, 131, 142, 144, 146, 149, 161, 178, 182, 183, 184, 186, 191, or 192.

*International economics*—courses concerned with the world economy and U.S. policy and practice in international trade and finance, selected from BAd 160, 166, 173; Econ 101, 102, 104, 121, 122, 134, 147, 151; Geog 125, 127, 133, 134, 135; Stat 111, 112.

*International communications*—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations, and public relations, selected from Anth 150, 153, 157, 161, 162, 168; Geog 125; Jour 145, 146; Jour/PSc 128; PSc 120, 129, 146; Psc 115, 151, 156.

*Regional study*—a concentration in one of the following areas.

*Africa*—courses selected from Anth 178; Geog 154; Hist 116; PSc 180, 181, 182.

*Europe*—courses selected from Econ 147; Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158; PSc 105–6, 130, 131, 161.

*East Asia*—courses selected from Anth 173, 175; Chin 163–64, 181, 182; Econ 169, 170; Geog 266; Hist 137, 187, 188, 189, 196; Japn 111–12; PSc 105, 170, 173.

*Latin America*—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 161, 162, 163–64, 165; IAff 287; PSc 183, 184.

*Middle East*—courses selected from Anth 177; Geog 154; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161.

*Soviet Union and Eastern Europe*—courses selected from Econ 133, 134; Geog 265; Hist 137, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166.

*Master of Arts in the field of international affairs*—This multidisciplinary program offers a wide choice of subject emphasis within the three broad categories of general fields, supplementary fields, and regional fields. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology, and sociology are applicable to the fields.

Prerequisite: the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. Required: the general requirements stated



under the Elliott School of International Affairs. All degree candidates must take 36 semester hours of course work and prepare for comprehensive examinations in three fields. Candidates select at least one general field from those listed below and may take no more than 18 hours in one department. Students may write a thesis if they qualify by having a minimum 3.5 G.P.A., submitting a previously written research paper of high quality, and submitting a formal thesis proposal approved by their prospective thesis advisor. Thesis candidates may take no more than 15 hours of course work in any one department.

Beyond these limits, students are free to select any of the fields listed below, so long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields in the Master's Comprehensive Examination.

**General fields**—At least one general field must be chosen from international politics (PSc 240 and 241), comparative politics (PSc 230 and 231), modern political theory (PSc 205 and either 206 or 207), and international economics (Econ 283-84).

**Supplementary fields**—Fields regularly offered include international law, international organization, international economic development, comparative aspects of communism, U.S. diplomatic history, U.S. foreign policy, U.S. foreign economic policy, history of strategy and policy, national security policy, and science, technology, and public policy.

**Regional fields**—Western Europe, Eastern Europe, Soviet Union, Middle East, Africa, South and Southeast Asia, China, Japan, and Latin America (for each geographic region, courses are generally available in modern history, government and politics, and economic problems).

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course offering a comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

156 **InterFuture: Independent Study Abroad** (15) Nimer

Comparative research in the United States and one or two other countries included in the InterFuture program. InterFuture scholars are selected on the basis of academic record and aptitude for independent research in a foreign environment. Enrollment limited to juniors in the Elliott School. (Spring)

190 **Special Topics in International Affairs** (3) Staff

Courses designed to focus on international affairs issues of a more current or topical nature. Topics announced in the *Schedule of Classes*. (Fall and spring)

195 **Internship: International Affairs** (1 to 6) Staff

Faculty-supervised internships in the Department of State, Organization of American States, and other agencies concerned with international affairs. Admission by permission of instructor. (Fall, spring, and summer)

198 **Independent Study and Research** (1 to 3) Staff

Upper-division students only. Written permission of instructor required. (Fall, spring, and summer)

287 **Problems in Latin American Civilization** (3) Klaren and Associated Faculty

Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Special Topics in International Affairs** (3) Staff

Courses designed to focus on international affairs issues of a more current or topical nature. Topics announced in the *Schedule of Classes*. (Fall and spring)

291 **Colloquium: East Asia** (3) Hinton

(Formerly PSc 291)  
Colloquium for advanced students of East Asian affairs. Admission by permission of the instructor. (Fall)

292 **Colloquium: The Soviet Union and Eastern Europe** (3) Staff

(Formerly PSc 292)  
Colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor.



- 293 **Colloquium: National Defense Policies and Issues** (3)  
(Formerly PSc 290)  
Colloquium for advanced students of security policy studies. Admission by permission of the instructor. Staff
- 298 **Independent Study and Research** (1 to 3)  
Limited to M.A. degree candidates. Written permission of instructor required. Staff
- 299-300 **Thesis Research** (3-3)  
(Fall, spring, and summer) Staff

### ITALIAN

See **Romance Languages and Literatures.**

### JAPANESE

See **East Asian Languages and Literatures.**

### JOURNALISM

Professor P. Robbins

Professorial Lecturers F.L. Dennis, J. Coldsmith, L.B. Laurent

Associate Professors R.C. Willson (Chair), C.W. Puffenbarger

Associate Professorial Lecturers J.P. McGill, W.R. Fonda, R.R. Mueller, T.O. Cron, D. Haun,

J.R. Fogarty, D.L. Smith, H. Goro, R.S. Becker

Assistant Professorial Lecturers E.B. Feldman, M.C. Sheward

*Bachelor of Arts with a major in journalism (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under *Columbian College of Arts and Sciences*. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51-52 or 71-72; Jour 71-72; PSc 1 and 2.
3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; (b) 9 semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 128, 129, 140, 141, 142, 145, 146, 150, 170, 190, 199.
4. Required as a secondary area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181-82; PSc 110, 111, 112, 114-15, 116, 118, 119, 120, 122; Psyc 115; Comm 132, 133, 134, 135-36, 145; Stat 53, 105, 129.

Enrollment into the major is restricted; contact the department office for details.

*Minor in journalism*—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; three courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155; and any one other journalism course.

*Special Honors*—Senior journalism majors with a grade-point average of 3.5 in at least five second-group journalism courses may apply for special honors at the start of the senior year with submitted proof of ability in print or broadcast professional media. They then must complete degree requirements with grades of A or B in at least 50 percent of all work done at this institution, must earn a quality-point index of at least 3.5 for all second-group journalism courses taken, and, four weeks before expected graduation, must submit to the department published or broadcast professional work completed during the senior year.

**Departmental prerequisite:** Jour 111 and permission of the department are prerequisite to Jour 115, 125, 133, 135, 137, 138, 139, 151, 155, 190, and 196.



## First Group

71-72 **Introduction to Mass Communication** (3-3)

Willson

Jour 71: Study of U.S. news media from colonial times to the present, with consideration of political, social, and economic developments. Strong emphasis on media relations with government and on the evolving concept of freedom of the press. Jour 71 can be taken concurrently with Jour 111. Those who lack knowledge of U.S. history should take Hist 71-72 before taking Jour 71. Jour 72: The U.S. press, radio, television, and other mass media today. Problems of monopoly, libel, government regulation, ethics, and news media responsibility. Brief survey of news media operations and press freedom in other nations. Jour 72 may be taken before Jour 71. (Academic year)

## Second Group

111 **Reporting** (3)

Robbins, Puffenbarger

Gathering information, evaluating it, and writing news and feature stories with emphasis on print media. Historical, ethical, and legal perspectives of journalistic reporting. Laboratory writing and live reporting assignments on campus and within the metropolitan area, with concentration on government and politics. Typing required. Freshmen must obtain departmental permission before enrolling. Laboratory fee, \$10. (Fall and spring)

115 **Newspaper Editing and Make-up** (3)

Puffenbarger

Modern newspaper design and the editing and page layout process. Practical work in selecting and editing stories for publication; writing headlines and photo captions; selecting, sizing, and cropping photos and other graphic materials; and laying out pages. Procedures and ethics for editors and designers. Prerequisite: Jour 111 or permission of the department. (Fall and spring)

116 **Magazine Layout and Design** (3)

Smith

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3)

Staff

The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

121 **Feature Writing** (3)

Willson

Free-lancing nonfiction articles; obtaining materials through independent investigation. Permission of the instructor required. (Spring)

125 **Science Writing** (3)

Staff

Writing science news for the mass media. (Spring)

128 **Government Process and the Media** (3)

Manheim

Examination of the roles played by the news media that affect the political process, including the impact the media have on the Presidency, the Congress, and the bureaucracy, and the adequacy of news organizations to provide information and analysis needed by citizens to exercise effective self-government. Same as PSc 128. (Fall and spring)

129 **TV News: The Politics of Visibility** (3)

Larson

Same as Comm/PSc 129.

133 **Advanced Reporting: Public Affairs** (3)

Puffenbarger

Coverage and writing of local and state governmental news. (Fall and spring)

135 **Advanced Reporting: Consumer and Service Journalism** (3)

Cron

Specialized training in writing service stories and consumer news. (Fall)

137 **Advanced Reporting: National Affairs** (3)

Fogarty

Coverage and writing of federal government news. (Fall)

138 **Investigative Reporting** (3)

Puffenbarger

In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring)

139 **Advanced Reporting: Radio and Television News** (3)

Feldman

Preparing news and public affairs programs for broadcast media. (Fall and spring)



- 140 **Photojournalism** (3) Elements of effective news and feature photographs, including study and evaluation of slides taken by students. Picture selection, cropping, captions. Student costs include film and development of slides. (Fall and spring) Goro
- 141 **Intermediate Photojournalism** (3) Students take, develop, and print their own black-and-white photographs for more intensive study of news and feature pictures. Some editing, layout, and photo essays. Students purchase their own film and print paper. Laboratory fee, \$54. Prerequisite: Art 23, Jour 140. (Spring) Haun
- 142 **Advanced Photojournalism** (3) Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, \$54. Admission by permission of instructor. (Spring) Staff
- 145 **Principles and Problems of Public Relations** (3) McGill, Mueller, Sheward Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring) Staff
- 146 **Government Information** (3) Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring) Puffenbarger
- 150 **News Coverage in Washington** (3) The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings. Robbins
- 151 **Editorial Writing** (3) Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. Permission of the instructor required. (Spring) Laurent
- 155 **Critical Writing and Reviewing** (3) Reviewing and commenting on the arts and entertainment for the mass media. (Spring) Coldsmith
- 170 **News Publication Management** (3) The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring) Staff
- 190 **Internship in Journalism** (3) Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring) Staff
- 195 **Documentary Photography** (3) Same as Art 195. Laboratory fee, \$54. Staff
- 196 **Senior Project** (3) Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval and filed with the student's advisor in the semester before registration. (Fall and spring) Dennis, Becker
- 198 **Law of the Press** (3) Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, news-gathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall) Staff
- 199 **Special Topics in Journalism** (3) Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.



## JUDAIC STUDIES

**Committee on Judaic Studies**

M. Ticktin (Chair), B. Reich, H.M. Sachar, H.E. Yeide, Jr.

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see Religion].)

**Bachelor of Arts with a major in Judaic studies (interdepartmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 21-22, 23-24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
  - (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113-14 or 115-16, 213 or 238.
  - (b) two related courses selected from each of two of the following groups: I—Anth 3, 177; Art 111, 112; II—Clas 100, 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 156, 171, 172, 193, 194, 250, 290, 292, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—Geog 154; PSc 126, 177, 178, 277, 278, 290; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 209, 291, 292.

Students applying for the 90-hour degree program in Judaic studies must, in addition to meeting the general requirements stated under Columbian College of Arts and Sciences, present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

**Minor in Judaic studies**—Required: A minimum of 18 semester hours, chosen in consultation with an advisor designated by the Committee on Judaic Studies, from Clas 21-22, 23-24, 25-26, 100, 101, 102, 103, 104; Hist 156, 158; PSc 179; Rel 9, 23, 103, 107, 113, 114, 115, 116, 174, 184, 209, 213, 238.

The courses listed below represent the core of the Judaic Studies curriculum available for undergraduate and graduate students:

Clas 21-22	Beginning Hebrew
Clas 23-24	Intermediate Hebrew
Clas 25-26	Yiddish for Reading and Conversation
Clas 100	Modern Hebrew Literary Classics
Clas 101	Israeli Society and Culture: Literary Perspectives
Clas 102	Contemporary Israeli Short Stories and Poetry
Clas 103	Modern Hebrew Nonfiction
Clas 104	Modern Hebrew Fiction
Clas 185-86	Directed Reading
Hist 156	Jewish History from 70 A.D. to 1648
Hist 158	Modern Jewish History
Hist 250	Readings Seminar: Issues and Topics in Jewish History
Hist 290	Research Seminar: Jews of the Islamic World
Hist 292	Israel, Zionism, and the Arab World
Hmn 1	Roots of the Western Tradition
PSc 176	The Arab-Israeli Conflict
PSc 179	Israeli Politics and Foreign Policy
Rel 9	The Hebrew Scriptures
Rel 23	Judaism: Identities and Ideas
Rel 103	The Prophets
Rel 107	Rabbinic Literature and Thought
Rel 113	Early Post-Biblical Judaism



Rel 114	Judaism in the Rabbinic Period
Rel 115	Judaism in the Medieval World
Rel 116	Judaism After Emancipation
Rel 137	The Land of Israel and the Growth of Western Religions
Rel 174	American Judaism
Rel 184	The Thought of Martin Buber
Rel 209	Seminar: Biblical Studies
Rel 213	Seminar: Judaism in Late Antiquity
Rel 238	Seminar: Contemporary Judaism
Rel 291-92	Readings and Research

### KOREAN

See East Asian Languages and Literatures.

### LATIN

See Classics.

### LATIN AMERICAN STUDIES

Program Committee: P.F. Klarén (Director), C.J. Allen, Y. Captain-Hidalgo, M. Gordon, C. McClintock, J. Quiroga

The Elliott School of International Affairs offers multidisciplinary programs leading to a Bachelor of Arts with a major in Latin American studies and to a Master of Arts in the field of Latin American studies.

*Bachelor of Arts with a major in Latin American studies*—The following requirements must be fulfilled.

1. The general requirements stated under the Elliott School of International Affairs.
2. Prerequisite courses—see the Elliott School of International Affairs, Curriculum Requirements.
3. Required courses for the major—Anth 172 or 185 or 190; Econ 185; Geog 161; Hist 163-64; IAff 287; PSc 183, 184; Span 1-2-3 and 4 or equivalent (Span 9, 10 are recommended) and two courses selected from Span 151-52, 155-56, 157-58, or other approved courses in Spanish literature.
4. Fifteen semester hours of additional course work must be taken in one of the following Departments: Anthropology, Economics, Geography and Regional Science, History, Political Science, and Romance Languages and Literatures (courses in Hispanic literature).
5. Students who plan to apply for graduation with Special Honors must take a research course in the field of concentration and complete an independent study project with distinction.

*Master of Arts in the field of Latin American studies*—Prerequisite: the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. Required: the general requirements stated under the Elliott School of International Affairs.

The program offers a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. All students must take the interdisciplinary seminar, IAff 287, Problems in Latin American Civilization. (Students with no previous course work in Latin American history, politics, literature, geography, or anthropology should consult with the program director to determine ways to acquire the necessary background.)

All students must demonstrate proficiency in Spanish or Portuguese through a reading comprehension examination. For students whose native language is Spanish or Portuguese, an English language examination will be substituted.

Degree candidates who choose the thesis option must take Master's Comprehensive Examinations in two fields. This can include one major field (12 semester hours, including



IAff 287) and one minor field (6 semester hours), or it can be two major fields (9 semester hours each).

Those who select the nonthesis option must take Master's Comprehensive Examinations in three fields, which can include one major field (12 hours) and two minor fields (6 hours each) or two major fields (9 hours each) and one minor field (6 hours). One minor field may be selected from demography, international business, rural development, urban and regional planning, tourism administration, women's studies, and science, technology, and public policy. At least two courses must be research seminars requiring a substantive paper.

The following graduate courses pertain to Latin American studies.

- Anth 268 Seminar: Peasant Society
- Anth 272 Seminar: Topics in Latin American Anthropology
- Anth 282 Seminar: Advanced Archaeology—New World Prehistory
- Econ 251 Economic Development Theories
- Econ 252 Economic Development Planning
- Econ 283–84 Survey of International Economic Theory and Practice
- Econ 285–86 Economic Development of Latin America
- Geog 223 Seminar: The Population–Food Balance
- Geog 250 Seminar: Regional Development
- Geog 261 Seminar: Geography of Latin America
- Hist 261–62 Readings/Research Seminar: Topics in Modern 20th-Century Latin America
- IAff 287 Problems in Latin American Civilization
- PSc 283 Governments and Politics of Latin America
- PSc 284 International Relations of Latin America

### LEGISLATIVE AFFAIRS—GRADUATE PROGRAM

Academic Director C.J. Deering

The Graduate School of Arts and Sciences offers a program leading to the degree of Master of Arts in the field of legislative affairs. This program focuses on the U.S. Congress with emphasis on the legislative process, American political institutions, and public policy analysis.

Master of Arts in the field of legislative affairs—Prerequisite: a bachelor's degree with a B average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The curriculum of 33 hours of course work includes the two courses from each of the four groups listed below. Each course carries 3 credit hours. The remaining courses are selected in consultation with the advisor. All students must pass a Master's Comprehensive Examination.

#### Group I—Legislative Processes

- PSc 218 Legislative Politics
- PSc 234 Comparative Legislative Systems

#### Group II—The Processes of Politics

- PSc 215 Judicial Policy-making
- PSc 216 American Presidency
- PSc 219 American Political Parties and Elections
- PSc 220 Public Opinion and Political Socialization
- PSc 221 Interest-Group Politics
- PSc 226 Budgetary Politics
- PSc 227 Electoral Laws and Financial Practices
- PSc 228 Media and Politics
- PSc 246 U.S. Foreign Policy-Making
- PSc 286 Selected Topics in American Politics



## Group III—Public Policy Analysis

PSc 212 State and Urban Policy Problems

PSc 222 Science, Technology, and Public Affairs

PSc 224 Domestic Policy Analysis—Selected Topics

PSc 225 Budgetary Policy

PSc 249 U.S. National Security Policy

PSc 250 Foreign Policy Analysis—Selected Topics

WStu 240 Women and Public Policy

## Group IV—Legislative Research and Analysis

PSc 200 Introduction to Political Analysis

PSc 203 Approaches to Public Policy Analysis

**LIBERAL ARTS**

Advisor J. Ziolkowski

*Bachelor of Arts: Program in the Liberal Arts (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Humanities—39–45 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, and 101. If Engl 11 or 12 is waived by departmental examination, Engl 111 or a creative writing course may be selected along with Engl 101 in satisfaction of this requirement.

(b) 6 semester hours selected from courses in a foreign language beyond the second-year sequence. This requirement may be waived if advanced literature courses (such as Fren 51–52), in which all the reading is done in the foreign language, are taken to satisfy 2(c).

(c) 18 semester hours selected from the following: AmCv 71–72, 171–72, 771, and 772; any course in English translation offered by the Classics Department (excluding Clas 63); Chin 163–64, 181–82; Japn 111–12; any literature course offered by the English Department; any course in English translation offered by the Germanic Languages and Literatures Department; any Humanities course; Fren 53, 54, or 90; Ital 51–52; Span 53, 54, or 90; Slav 91–92. In most cases, the third year of foreign language study (such as Fren 9–10) cannot be applied toward this requirement.

(d) 6 semester hours selected from Phil 50, 71, 111, 112, 113, 162, 172

(e) 3 semester hours selected from Rel 1, 2, 9, 10, 103, 105, 111, 113, 114, 115, 116, 121, 157, 158, 159, 160, 161, 163, 164, 165

(f) 6 semester hours selected from any combination of the following: any art history course (except Art 119, 162, and 173 through 198); Comm 49, 126, 143, and 144; Mus 3, 4, 7, 8, 101–2, 103–4, 109, 110, 121; TrDa 45, 46, 145–46, 151, 152, 153, 190, 191

3. Social Sciences—18 semester hours:

(a) 6 semester hours of second-group history courses (excluding Hist 191–92 and 197)

(b) 6 semester hours selected from Econ 1–2 or PSc 1, 2, 3–4, and all political science courses numbered 105 through 186 and 190

(c) 6 semester hours selected from one of the following groups: Anth 2, 3, 150, 151, 152, 158, 161, 162, 173, 175, 177; Geog 1, 2, and all second-group courses except Geog 104 through 107, 120, 121, 151 through 161; Psyc 1 combined with Psyc 8, 111, 129, 144, or 151; any approved combination of courses offered by the Sociology Department

4. Natural and Mathematical Sciences—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences, one sequence selected from BiSc 3–4 or 11–12; and Geol 1–2, 5, or 105 and one sequence selected from Chem 3–4 or 11–12; and Phys 1 or 21 with 5, and 2 or 22 with 6, or 9–10

(b) 6 semester hours selected from Math 9–10, 12–13, 30 through 33, 51–52, or another approved combination of courses that includes at least one second-group course

5. Electives—35–45 semester hours of courses selected in consultation with the advisor

A student must earn a grade of C– or better in all second-group courses offered in fulfillment of the requirements of this program. If a student chooses a major, elective



courses may be used to fulfill its requirements. A minimum of 36 semester hours must be taken in second-group courses. See Interdisciplinary Programs under Columbian College of Arts and Sciences for a general description of this program.

## MANAGEMENT SCIENCE

Professors P.B. Vaill, J.B. Harvey, W.E. Halal, E.H. Forman, S.A. Umpleby, J.F. Lobuts, Jr., J.D. Frame (Chair), E.K. Winslow, J.H. Carson  
 Professorial Lecturers Z.A. Shavell, A.S. Adams, G.T. Solomon, A.V. Harrell  
 Associate Professors W.W. Hardgrave, J.P. Coyne, L.E. Graff, T.J. Nagy, W.G. Wells, Jr., P.W. Wirtz, W.J. Wenker, J. Liebowitz, J.M. Cary, R.G. Donnelly  
 Associate Professorial Lecturers C.A. Gruel, J.M. Montgomery  
 Assistant Professors Z. Karake (Visiting), R. Soyer

See the School of Government and Business Administration for programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information Systems Technology, and Doctor of Philosophy.

### First Group

- 58 **Introduction to Information Processing** (3) Liebowitz  
 Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve computer programming in a higher-level language and the use of applications software packages. (Fall, spring, and summer)

### Second Group

- 107 **Fundamentals of Behavioral Science** (3) Lobuts, Winslow  
 Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes that contribute to the functioning of organizations. (Fall and spring)
- 119 **Computer Programming and Data Structures** (3) Coyne, Forman, Wirtz  
 For students already familiar with basic computer concepts and programming, who will learn a programming language, such as C or COBOL, useful for business applications. Emphasis on computer applications in accounting and management information systems through hands-on programming. Prerequisite: Mgt 58 or Stat 130. (Fall and spring)
- 120 **Structured Development with CASE** (3) Carson, Wenker, Coyne  
 Analysis, design, and implementation of management information systems (MIS). Structured methodologies and techniques for various stages of the MIS development process. Computer-aided software engineering tools. Prerequisite: Mgt 119 or permission of instructor. (Fall)
- 121 **Expert Database Systems** (3) Coyne, Carson, Wirtz  
 Theory, architecture, and implementation of database management systems in corporate and organization information systems. Fundamental concepts of database management and processing. Expert database systems. Hands-on experience with database management packages. Prerequisite: Mgt 119 or permission of instructor. (Spring)
- 122 **Applied Artificial Intelligence** (3) Nagy, Liebowitz  
 An independent or group-study project in information systems development, which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Expert systems and artificial intelligence are also discussed. Prerequisite: Mgt 120 and 121 or permission of instructor. (Spring)
- 190 **Special Topics in Management Science** (3) Staff  
 Experimental offering; new course topics and teaching methods. May be repeated once for credit.



- 191 Introduction to the Computer-Based Society (3)** Wirtz  
Introduction to the role and function of computer technology in today's society. Topics include applications in office automation, business and finance, manufacturing, and education. Issue areas include changing employment patterns, computers and the individual, security and crime, and international competition. Computer software use includes word processing, spreadsheets, database management, and graphics applications packages. Open only to students who reside in Building JJ. (Fall)
- 192 Our New Era: Technology and Society (3)** Wirtz  
This is the second in the sequence for the residential program Technology and Society. In this course more advanced computer applications will be explored in the context of their relationship to societal issues, generated by the impact of technology. Students research and report on selected technology-related issues and future trends. Student groups pursue semester projects in selected computer applications areas. Open only to students who reside in Building JJ. (Spring) Staff
- 199 Individual Research (3)**  
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall, spring, and summer)

### Third Group

- 201 Management of Strategic Issues (3)** Halal, Lenn, Adams  
The body of management theory and practice that has evolved recently to identify, analyze, and resolve strategic organizational issues. A survey of the methodology of the field; applications to critical issues in labor relations, energy and pollution, marketing and consumerism, business-government relations, and the global economy. Prerequisite: Mgt 205 or equivalent. (Spring and summer) Vaill, Halal
- 205 Organization and Management (3)**  
For designated students in the M.B.A. program. Integrative approach to organizational concepts, management principles, philosophy, and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management. (Fall, spring, and summer) Halal
- 206 Strategic Planning (3)**  
Formulation of strategies that enable organizations to adapt to changing social, technological, economic, and political conditions. Lectures, discussion, and exercises examine strategic planning practices and the environmental changes affecting corporations, government agencies, hospitals, and other major institutions. Students conduct a strategic planning project for an organization. (Fall) Winslow, Solomon
- 208 Entrepreneurship (3)**  
In exploring the "entrepreneur as a phenomenon," students will be exposed to the theory and experiences associated with entrepreneurs, entrepreneurial acts, and entrepreneurship in all organizational settings—large, small, public, and private. Prerequisite: Mgt 205 or permission of instructor. (Fall and spring) Harvey, Winslow, Vaill, Lobuts
- 210 Individual and Group Dynamics in Organizations (3)**  
For graduate students who wish to improve their skills in dealing with human behavior in organizations. The course is designed to improve theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individual and group behavior in various organizational settings. Intensive work-group experience, focusing on theory, research, and group analysis. (Fall, spring, and summer) Winslow, Lobuts
- 211 Current Issues in Organizational Behavior (3)**  
Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems in organizational settings. Problems of conducting behavioral science research in organizations. (Fall)



- 212 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow  
Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning, using various media. This course emphasizes the relationship between theory and practice. (Fall, spring, and summer)
- 213 **Organization Development: A Management Function** (3) Lobuts, Harvey, Vaill  
An exploration of the literature, culture, values, and skills that can assist a manager, leader, or administrator in carrying out the process of organizational development. Emphasis is on direct managerial intervention, although the role of consultants/facilitators in the process is explored. (Fall)
- 214 **Behavioral Factors in Management Consulting** (3) Harvey, Vaill, Lobuts, Winslow  
Theories and methods of planning, introducing, and coping with change in management through the helping process. The dynamics of the consulting process includes phases of consultation, power dynamics, interpersonal relationships, and values. Intended both for managers seeking an understanding of the consultative approach to planned change and for persons in staff or consultative roles seeking such skills and understanding. (Spring)
- 215 **Conflict Management: Theory, Concepts, and Methods** (3) Lobuts, Harvey, Winslow  
Exploration of various approaches to the causes of conflict and its resolution. Students study and experience ways to make conflict a creative rather than a destructive experience. Methods of conflict resolution are practiced. Conflict in the micro (person-to-person) and macro (system-to-system) levels are explored. (Fall and spring)  
Prerequisite: Mgt 210 or permission of instructor.
- 216 **Cross-Cultural Management** (3) Vaill  
This course focuses on the variety of issues and opportunities that arise when managing outside one's own culture. The manager's credibility and effectiveness are assumed to be culture bound to some extent; outside of one's culture, one's actions may not mean what they do within one's culture. Emphasis on the personal level as opposed to the interinstitutional or intercultural levels. Extensive use of student experiences and research. (Summer)
- 218 **Computer Applications in Production/Operations Management** (3) Forman, Graff, Liebowitz  
For designated students in the M.B.A. program. Fundamentals of production/operations management and its tools and techniques used to solve decision problems. Inventory management, resource allocation, production planning, project management, and forecasting. Linear programming, queueing analysis, spreadsheets, database systems, BASIC. Principles, terminology, and organization of computer systems used in dealing with production/operations management. (Course equivalent BAd 188 and Mgt 58 or two similar courses.) (Fall, spring, and summer)
- 220 **Operations Research in Decision Support Systems** (3) Forman, Graff, Hardgrave, Wirtz  
Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Topics selected from linear programming, probability, decision-making under uncertainty, queueing and inventory models, regression, project management. Prerequisite: Mgt 218 and 270, or equivalent. (Fall and spring)
- 221 **Introduction to Probability Theory and Applications** (3) Hardgrave, Forman, Wirtz  
Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 42 or 52 or equivalent. (Alternate years)



- 222 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Graff  
 Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 42 or 52 or equivalent. (Alternate years)
- 223 **Techniques of Operations Research** (3) Hardgrave, Forman, Graff  
 Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models, and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 221, 222. (Alternate years)
- 224 **Executive Decision Support** (3) Forman  
 Concepts and methods for making complex decisions in both business and government; identifying criteria and alternatives, setting priorities, allocating resources, strategic planning, resolving conflict, and making group decisions. (Fall and spring)
- 225 **Statistical Modeling and Analysis for Decision Support** (3) Wirtz, Graff  
 (Formerly Mgt 274)  
 The process of specifying, analyzing, and testing models of human and systemic behavior. Formalization of models; statistical test comparison and selection; computer implementation of univariate, bivariate, and multivariate tests; creating, sorting, and merging computerized data files; transforming and recoding data to meet statistical assumptions; hypothesis testing. Introduction to the general linear model: linear regression, analysis of variance, and analysis of covariance. Prerequisite: Mgt 270 or equivalent. (Fall and spring)
- 226 **Decision Support Systems** (3) Forman, Graff, Hardgrave, Wirtz  
 Framework, processes, and technical components for building decision support systems dealing with unstructured and underspecified problems from managerial and organizational perspectives. Construction and exploration of decision support system models. Prerequisite: Mgt 220 or permission of instructor. (Spring)
- 229 **Modeling in Applied Operations Research** (3) Hardgrave  
 Advanced modeling exercises in applied operations research. Prerequisite: Mgt 223 or permission of instructor. (Alternate years)
- 230 **Management of Research and Development** (3) Donnelly, Wells  
 Technological, economic, and political factors that influence research and development in private, military, and other public organizations. Science and technology policy issues. Management for innovation. Methods for selection of projects, allocation of resources, and technology planning. The management of projects of various scales and introduction to flexible manufacturing. Protection of intellectual property and indicators of technological achievement. Corporate venture divisions. Case studies of organizations active in various facets of technology development, both domestic and international. (Fall and spring)
- 231 **Project Management** (3) Wells, Frame  
 Practical examination of how projects can be managed from start to finish, including specific emphasis on planning and controlling to avoid common pitfalls. Identifying needs, defining requirements, project costing, scheduling, resource allocation, and project politics. Configuration management; microcomputer applications. (Fall, spring, and summer)
- 232 **International Science and Technology** (3) Frame, Wells  
 Technology transfer among advanced countries and LDCs; national science and technology policies of various countries; international comparisons of scientific and technological capabilities; the technological basis for international trade and business; international licensing, patenting, and joint ventures; science and technology in economic development; international organizations; global transfer of military technologies; export controls of technology; major global issues concerning science and technology. (Fall, spring, and summer)



- 233 **Emerging Technologies** (3) Halal, Frame  
Exploration of new developments in scientific and technological innovation, including automation, energy, medicine, bioengineering, social science, information technology, states of consciousness, and space. Emphasis on forecasting these technological advances and assessing their economic and social effects. An overarching theme is the role of advancing technology in driving social change. (Spring)
- 235 **Technological Entrepreneurship and Innovation** (3) Donnelly, Frame  
Insight into the process of innovation and entrepreneurship in new ventures. Organizing for innovation, raising venture capital, tax considerations, managing the small technology-based venture, marketing technology. Case studies of companies involved in recent low- to high-tech ventures. Group development of a model business plan for a technology-based venture. (Spring and summer)
- 239 **Seminar: Management of Technology Development** (3) Donnelly, Wells  
Capstone course providing an overview and integration of the field of management of science, technology, and innovation in the private and public sectors. Implementation of technology in the public sector and its commercialization in the private sector. The technology development process, from the early stages of new product conceptualization to marketing and operational use. A major simulation completes the course. Prerequisite: a minimum of 6 semester hours of field-related courses as prescribed by the instructor or permission of instructor. (Fall)
- 240 **Survey of Information Technology** (3) Graff, Carson, Liebowitz, Wenker  
Management-oriented survey of key areas in information technology, including hardware, software, systems development, management, and the computing milieu. Prerequisite: Mgt 218 or permission of instructor. (Fall, spring, and summer)
- 242 **Systems Analysis for Information Systems I** (3) Wenker, Liebowitz  
Systems analysis for the development of a requirements specification for an information system. Topics include data gathering, information flow modeling, data item identification, data file organization, input/output requirements identification, and the identification of other requirements, such as reliability, response time, workload capability, environmental conditions, and training. Prerequisite: Mgt 240. (Fall and spring)
- 243 **Human Factors in Information Systems** (3) Nagy, Coyne, Cary  
The user-system interaction that occurs with computerized information systems. The human factors of on-line dialogues, user psychology of computer systems, and various approaches to user-system interaction are considered. Examples of user-system interfaces from a variety of personal computer systems. Emphasis on the development of effective user-system interfaces using artificial intelligence software. Prerequisite: Mgt 240. (Fall and spring)
- 244 **Telecommunications: Technology, Applications, and Operations** (3) Cary  
Basic technical concepts, applications, and trends of telecommunications; operations; cost considerations of implementing telecommunications systems. Prerequisite: Mgt 240. (Fall and spring)
- 245 **Database Management for Information Systems** (3) Coyne, Cary  
Introduction to the theory, architecture, and implementation of database management systems in corporate and organization information systems. Emphasis on fundamental concepts of database management and processing; broad understanding of designing data bases for business applications and implementing such data bases using commercially available packages; current trends in database systems. Prerequisite: Mgt 240 or permission of instructor. (Fall and spring)
- 249 **Seminar: Information Technology** (3) Graff, Wenker  
Current trends in the design and implementation of computer-supported systems; emphasis on current state of the art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor. (Fall and spring)



- 253 **Security and Privacy of Information Systems** (3) Wenker, Cary  
An advanced course in information technology, emphasizing the philosophies, principles, and practices of security management in and impact of privacy legislation on computer-based systems. Risk assessment, state-of-the-art measures, trends in the information security field, and roles of the various levels of management and technological staff. Prerequisite: Mgt 218 or 240. (Spring)
- 255 **Applied Expert Systems** (3) Nagy, Liebowitz  
Expert systems are interactive computer programs that can perform as well as experts in some specialized area, explain their reasoning and conclusions, tolerate incomplete and imprecise descriptions, and perform non-numeric computations. Students obtain hands-on experience in using expert system technology by building a Business Expert System. Prerequisite: Mgt 240 or permission of the instructor. (Fall, spring, and summer)
- 261 **Introduction to Systems Theory and Cybernetics** (3) Umpleby  
Systems theory and cybernetics provide principles that govern information processing and decision-making activities, whether these occur in human beings, machines, or social organizations. The course covers ways of conceptualizing systems, strategies for regulating systems, and paradoxes involved in self-regulation. (Fall)
- 262 **Methods for Making Organizations Adaptive** (3) Umpleby  
An adaptive organization must solve day-to-day problems and periodically restructure itself to meet new challenges and opportunities. The course reviews several strategies for conducting a group planning process and introduces several models of ideal organizations. Students conduct an interactive planning process with people in an organization. (Spring)
- 264 **System Dynamics Modeling** (3) Umpleby  
Computer modeling of organizational problems using system dynamics and the dynamo programming language. Review of previous applications of system dynamics and comparison of system dynamics with other modeling approaches. Causal influence diagrams, level and rate diagrams, equations, testing, and analysis. In conjunction with people in an organization, students develop a system dynamics model of some aspect of the organization. (Fall)
- 265 **Artificial Intelligence and Cybernetics** (3) Umpleby  
Artificial intelligence is one approach to building computers that simulate human behavior. Cybernetics provides a theory of information processing and cognition that can be used both in the design of software and the interpretation of implications of new computer technology for individuals and organizations. The course reviews the theoretical and philosophical literature on the prospects for automating intelligent behavior. (Spring)
- 270 **Mathematics and Statistics for Management** (3) Forman, Graff, Hardgrave, Wirtz  
For designated students in the M.B.A. program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, and regression and correlation. (Fall, spring, and summer)
- 275 **Advanced Statistical Modeling and Analysis** (3) Hardgrave, Wirtz  
Advanced topics associated with the general linear model. Testing for and remediation of assumption violations, such as homoscedasticity, normality, and linearity. Detection of outliers, influential observations, and multicollinearity. Alternative design strategies in the analysis of variance (e.g., blocking, repeated measures); a priori and a posteriori tests; testing for interactions and parallelism. Prerequisite: Mgt 225 or permission of instructor. (Fall and spring)
- 276 **Exploratory and Multivariate Data Analysis** (3) Hardgrave, Wirtz  
Introduction to graphical and other methods for exploratory data analysis. Application and comparison of advanced multivariate analytical procedures selected from principal components analysis, factor analysis, multivariate analysis of variance, discriminant analysis, canonical correlation, multidimensional scaling.



- ing, linear structural modeling, cluster analysis, path analysis, loglinear analysis, and maximum likelihood latent structure analysis. Prerequisite: Mgt 225 or permission of instructor. (Spring)
- 280 **Information Systems Development and Application** (3) Cary  
Current philosophies, principles, and practices common to development and application of information systems. Classical and structured systems development. Alternative automated development approaches, including prototyping using fourth generation languages and evolving computer-aided software engineering tools, with emphasis on systems analysis. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall, spring, and summer)
- 281 **Foundations of Artificial Intelligence** (3) Wirtz, Nagy, Liebowitz  
Logical foundations, components, and processes of automated reasoning systems. Alternative inference rules and their relationship to problem types. Introduction to the use of predicate calculus, recursive techniques, and linked lists in the solution of logical problems. Students use the computer to solve alternative problem types in a contemporary artificial intelligence language. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall)
- 282 **Information Systems and Telecommunications** (3) Cary, Carson, Forman  
Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware and software considerations, and the Open System Interconnection model-based communication. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall, spring, and summer)
- 283 **Topics in Higher-Level Languages** (3) Carson, Nagy, Wirtz  
The emerging high-level languages used for the development of information systems. The very-high-level languages, such as PROLOG, MUMPS, and APL, are addressed along with systems languages, such as C, Modula 2, and Ada. The syntax, semantics, and applicability of the languages are discussed in detail. Not all languages are offered every semester; programming assignments are made in the languages studied. May be repeated once with approval of instructor. Prerequisite: Mgt 120 and 280. (Fall and spring)
- 284 **Database Systems** (3) Coyne, Cary  
An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective database system. Topics include database organization, creation, and maintenance; evaluation criteria; standardization of database systems; and analysis of the state of the art in database development. Prerequisite: M.S. in I.S.T. degree candidacy; Mgt 280 or permission of instructor. (Fall and spring)
- 285 **Workshop in Database and Expert Systems** (3) Coyne, Forman  
Analysis and solution of complex information problems through commercially available database and expert systems; development of evaluation methodology, comparison of implementation strategies. Hands-on experience with major commercial systems. Prerequisite: M.S. in I.S.T. degree candidacy; Mgt 284 or permission of instructor. (Fall and spring)
- 286 **Operating Systems** (3) Carson  
Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical requirements of each are specified, including data structuring, multiprogramming, I/O spooling, and job control. Commercial operating systems studied as examples. Prerequisite: M.S. in I.S.T. degree candidacy. (Fall)
- 287 **Design of On-Line Information Systems** (3) Carson  
Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis, functional specifications, file design, man-machine dialogue design, response time requirements, user psychology. Prerequisite: M.S. in I.S.T. degree candidacy; Mgt 284 or permission of instructor. (Spring)



- 288 **Applied Artificial Intelligence Programming** (3) Nagy, Wirtz, Liebowitz  
Experience in exploiting new methods of developing both traditional and artificial intelligence computer applications based on programming methods originating in artificial intelligence research. The focus of the course is rule-based, frame-based, example-based, object-oriented, and neural-net programming. Students use one or more of these to build a traditional system or an artificial intelligence system. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Spring) Staff
- 290 **Special Topics in Management Science** (3)  
Experimental offering; new course topics and teaching methods. May be repeated once for credit. Staff
- 298 **Directed Readings and Research in Management Science** (3)  
(Fall and spring) Staff
- 299 **Thesis Seminar** (3)  
(Fall and spring) Staff
- 300 **Thesis Research** (3)  
(Fall and spring)

#### Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

- 311 **Seminar: Public-Private Sector Institutions and Relationships** (3) Staff  
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status. (Academic year) Hardgrave
- 328 **Seminar: Operations Research** (3)  
Special topics and advanced applications in operations research, such as catastrophe theory, Markovian decision processes, or applications of the calculus of variation in economics and finance. May be repeated once for credit. Prerequisite: Mgt 223 or permission of instructor. Umpleby
- 365 **Seminar in Cybernetics and General Systems Theory** (3)  
A review of recent literature in the field; guiding questions that have led to the development of general systems theory and cybernetics; comparison of these theories with other approaches to understanding organizations and management. Prerequisite: Mgt 262. (Spring) Harrell, Wirtz
- 385 **Special Topics in Research Methods** (3)  
Research problems and issues related to student dissertations form topics for readings, group discussions, and assigned papers. (Fall and spring) Vaill
- 390 **Philosophical Foundations of Administrative Research** (3)  
Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring) Wirtz, Newcomer, Harrell
- 391 **Methodological Foundations of Administrative Research** (3)  
Examination of the process of social science research. Use of models and theoretical frameworks in research; formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Fall and spring) Staff
- 398 **Advanced Reading and Research** (arr.)  
Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to doctoral candidates. May be repeated for credit.



## MATHEMATICS

Professors T.P.G. Liverman, H. Kenyon, I. Katz, H.D. Junghenn (Chair)

Adjunct Professor J. Eftis

Professorial Lecturers Y. Akiyama, B.R. McDonald

Associate Professors I.I. Glick, M.P. Lee, E.A. Stone, M.M. Gupta

Assistant Professors F.E. Baginski, D.H. Ullman, V. Harizanov, E.A. Robinson, R. Simion, K.G. Hockett

Assistant Professorial Lecturer P. Echeverria

Instructor N. Taghavi

*Bachelor of Arts or Bachelor of Science with a major in mathematics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139, and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics, and engineering.
4. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

*Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in related areas:
  - (a) Stat 189-90.
  - (b) Eighteen semester hours to be selected, in consultation with the department advisor, from economics, statistics, engineering and physical sciences, or computer science. At least 12 semester hours must be chosen from one area, and at least 12 semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering, computer science, engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin*.
4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 124, 139, 140, and at least two courses from Math 180, 181-82. It is also strongly recommended that students take French, German, or Russian.
5. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

*Minor in mathematics*—Requirements: a minimum of 18 semester hours in mathematics courses, of which at least 9 hours must be at the 100 level or higher, chosen in consultation with a departmental advisor.

*Master of Arts in the field of mathematics*—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

*Master of Arts or Master of Science in the field of applied mathematics*—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, electrical, or mechanical engineering; operations research; or engineering administration), physics, statistics, or urban and regional



planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, which may include Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the Department of Mathematics and the department concerned with the area of application. There is no thesis requirement.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 semester hours from second-group courses. There is no thesis requirement.

*Doctor of Philosophy in the field of mathematics*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The department doctoral program committee, after consultation with the student, will stipulate (1) courses that must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, to satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, numerical analysis, ordinary and partial differential equations, combinatorics, graph theory, ergodic theory, semigroups, and topology (general topology, analytic topology, topological groups).

### First Group

#### 3 College Algebra (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring) Gupta and Staff

#### 6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3. (Fall and spring) Gupta and Staff

#### 9 General Mathematics I (3)

Logic, mathematical induction, sets, and elementary combinatorial analysis. (Fall and spring) Katz and Staff

#### 10 General Mathematics II (3)

Introduction to probability, vectors and matrices, systems of linear equations, linear programming, graph theory. (Fall and spring) Katz and Staff

#### 12 General Mathematics with Computers I (3)

Sets; logic; vectors and matrices. Functions and graphing instruction is accompanied by microcomputer practice, using the APL programming language. Primarily for nonscience majors. No computer experience needed. (Fall) Liverman

#### 13 General Mathematics with Computers II (3)

Introduction to the basic concepts of calculus. Elements of probability theory. Elements of trigonometry. Topics are presented with microcomputer accompaniment, using the APL programming language. Primarily for nonscience majors. Prerequisite: Math 12. (Spring) Liverman

#### 30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring) Kenyon and Staff



- 31 **Single-Variable Calculus I** (3) Kenyon and Staff  
Differentiation and integration of algebraic and transcendental functions with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and spring)
- 32 **Single-Variable Calculus II** (3) Kenyon and Staff  
Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)
- 33 **Multivariable Calculus** (3) Kenyon and Staff  
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)
- 34 **Computer Laboratory for Math 31** (1) Staff  
Function tabulation, curve sketching, limits, continuity, derivatives, optimization, integrals, Riemann sums, areas. Prerequisite: Concurrent registration in Math 31.
- 35 **Computer Laboratory for Math 32** (1) Staff  
Function tabulation, curve sketching, integrals, sequences and series, parametric equations, conic sections. Prerequisite: Concurrent registration in Math 32.
- 36 **Computer Laboratory for Math 33** (1) Staff  
Partial derivatives, surfaces, level sets, extrema of functions of several variables, vector fields. Prerequisite: Concurrent registration in Math 33.
- 37 **Computer Programming with Calculus** (3) Gupta  
Computer programming in conjunction with calculus, leading to a better appreciation of basic concepts, especially infinity and infinitesimals. Fundamentals of FORTRAN or BASIC, limits of functions and quotients, derivatives as limits of quotients. Increments and differentials (e.g., volumes as functions of radii); rates of change, indeterminate forms; definite integrals; trapezoidal rule; areas and volumes.
- 41 **Calculus for Economists I** (4) Junghenn and Staff  
Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent. (Fall)
- 42 **Calculus for Economists II** (4) Junghenn and Staff  
Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Spring)
- \*51 **Finite Mathematics for the Social and Management Sciences** (3) Glick and Staff  
Functions and graphs, exponential and logarithmic functions, systems of linear equations, matrix algebra, linear programming, difference equations and mathematics of finance. Prerequisite: Math 3 or equivalent. (Fall and spring)
- \*52 **Calculus for the Social and Management Sciences** (3) Glick and Staff  
Differential and integral calculus of functions of one variable; applications to business and economics. Prerequisite: Math 51 or equivalent. (Fall and spring)

## Second Group

- 101 **Introduction to Mathematical Logic** (3) Harizanov  
Mathematical or symbolic logic as the foundation of mathematics and a precise formalization of deductive thought. Logical correctness of real-life and mathematical reasoning. Formal languages, truth, and interpretations. Methods of proof that a conclusion follows logically from given assumptions. Two formalizations of human reasoning: the simpler propositional logic and first-order quantifier logic suited to deductions encountered in mathematics. Open to sophomores

\* Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52. Economics students are advised to take Math 41 and 42.



- with the permission of the department. Prerequisite: Math 32 or permission of instructor. (Fall, odd years)
- 102 **Axiomatic Set Theory** (3) Harizanov  
Set theory as a branch of mathematics and as the foundation for all branches of contemporary mathematics. Cantor's theory of sets. Contradictions in mathematics; Russell's paradox. Axiomatization of set theory as a framework for a contradiction-free mathematics. Zermelo-Frankel axioms; finite, countable, and uncountable sets; ordinal and cardinal numbers; construction and characterization of the integers, rationals, and reals. Prerequisite: Math 101 or permission of instructor. (Spring, odd years)
- 103 **Computability** (3) Harizanov  
An introduction to the basic ideas and results of computability theory (recursion theory). The unlimited register machine as a model of an idealized computer. Computable functions, Church's thesis, and decidable problems. Numbering programs, diagonal method, universal programs. Effective enumerability, creative and productive sets. Unsolvability of the halting problem and other theoretical limitations on what computers can do. Some other topics, such as Turing reducibility and degrees, and Kleene's fixed-point theorem. Prerequisite: Math 32 or permission of instructor.
- 105 **Problem Solving and Mathematical Proofs** (3) Ullman  
Types of reasoning encountered in mathematics. Techniques of problem solving and writing proofs. Induction. Relations. Cardinality. Introduction to the major subdisciplines of mathematics. Prerequisite: Math 32. (Spring)
- 106 **Introduction to Topology** (3) Stone and Staff  
Prerequisite: Math 139 or permission of instructor. (Fall)
- 107 **Introduction to Algebraic Topology** (3) Staff  
Prerequisite: Math 122 and 139, or permission of instructor. (Fall, even years, when demand warrants)
- 111 **Mathematics for Engineers and Physicists I** (3) Stone  
Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)
- 112 **Mathematics for Engineers and Physicists II** (3) Stone  
Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)
- 113 **Introduction to Combinatorics** (3)  
(Formerly Graph Theory)  
General introduction to combinatorial enumeration and graph theory. Basic counting techniques, inclusion-exclusion principle, recurrence relations, generating functions, pigeonhole principle, bijective correspondences, basic graph theory, applications. Prerequisite: Math 32; Math 132 is recommended but not required. (Fall and spring)
- 121-22 **Introduction to Abstract Algebra** (3-3) Lee  
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)
- 123 **Linear Algebra** (3) Katz  
Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. (Fall)
- 124 **Linearity and Matrices** (3) Liverman and Staff  
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and spring)
- 125 **Linear Programming** (3) Katz  
Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)



- 132 **Introduction to Discrete Structures** (3) Staff  
Joint offering of the Statistics and Mathematics Departments. Discrete structures and associated mathematical tools. Topics include sets, functions, relations, directed and undirected graphs, propositional calculus, Boolean algebras, with applications to computer science. Prerequisite: Stat 130 and Math 31. (Fall)
- 134 **Introduction to Boundary-Value Problems** (3) Gupta and Staff  
Prerequisite: Math 111 or 142. (Offered when demand warrants)
- 135 **Projective Geometry** (3) Staff  
Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)
- 139 **Advanced Calculus I** (3) Junghenn and Staff  
A rigorous study of differentiation, integration, and convergence. Topics covered: sequences and series, continuity and differentiability of real valued functions of a real variable, the Riemann integral, sequences of functions, and power series. Prerequisite: Math 33 or equivalent. (Fall)
- 140 **Advanced Calculus II** (3) Junghenn and Staff  
Continuation of Math 139. Topics covered include topology of  $\mathbb{R}^n$ , derivatives of functions of severable variables, inverse function theorem, implicit function theorem, multiple integrals, Stokes's theorem. Prerequisite: Math 139 or equivalent. (Spring)
- 141 **Differential Geometry** (3) Baginski  
Curves in space, regular surfaces, tensors, fundamental forms of a surface. Gauss's Theorema Egregium, Gauss-Bonnet theorem, minimal surfaces, theory of relativity. Prerequisite: Math 140; Math 123 or 124 or permission of instructor. (Fall)
- 142 **Introduction to Differential Equations** (3) Glick and Staff  
Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Spring)
- 153 **Introduction to Numerical Analysis I** (3) Gupta and Staff  
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)
- 154 **Introduction to Numerical Analysis II** (3) Gupta and Staff  
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)
- 157 **Introduction to Complex Variable Theory** (3) Liverman and Staff  
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139 or permission of instructor. (Spring)
- 168 **Seminar: Curriculum Studies** (3) Staff  
Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor. (Offered when demand warrants)
- 170 **Computational Complexity** (3) Harizanov  
Deterministic and nondeterministic Turing machines. Partial recursive functions and the Church-Turing thesis. Undecidable problems. Space and time complexity measures. Gap, speed-up, and union theorems. Decidable but intractable problems. The traveling salesman problem and other NP-complete problems. Prerequisite: Math 32 or permission of instructor.
- 180 **Computer Mathematics and Modeling** (3) Liverman  
Introduction to the APL programming language in the context of applications to numerical methods in mathematics and the sciences. Construction of mathemati-



cal models of physical and other systems. Individual or team projects using the microcomputer. Prerequisite: Math 32; Math 124 or permission of instructor. (Fall)

181-82 **Seminar: Applied Mathematics** (3-3)

Glick and Staff

Prerequisite: Math 140, Stat 189-90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 **Special Topics** (arr.)

Staff

Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 **Reading and Research** (arr.)

Staff

Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall and spring)

### Third Group

Courses marked with an asterisk are offered every year. Courses listed by title alone are offered when, and with such contents, as demand warrants.

### ALGEBRA

201-2 **Modern Algebra I and II** (3-3)

Katz

Fundamental concepts of groups, rings, and fields. (Academic year)

203 **Modern Algebra III** (3)

Katz

(Fall, odd years)

204 **Representation Theory** (3)

Lee

Representations of finite groups, including symmetric group, group characters, and induced representations. Prerequisite: Math 202. (Fall)

205 **Matrix Theory** (3)

Katz

Topics to be chosen from generalized inverses of matrices and their applications to solutions of equations and to LP problems; positive definite matrices and their applications; Riemann matrices; linear groups; quadratic forms and Hilbert's eleventh problem; numerical range of linear operators. (Spring, even years)

206 **Topics in Algebra** (3)

Staff

### ANALYSIS AND APPLIED MATHEMATICS

\*211 **Complex Analysis I** (3)

Glick and Staff

Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Spring)

212 **Complex Analysis II** (3)

Glick and Staff

Harmonic functions, partial fractions. Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function; Hurwitz's theorem, normal families of functions. The Riemann mapping theorem; analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent. (Spring, even years, when demand warrants)

213 **Applications of Complex Analysis** (3)

Liverman and Staff

Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions; steepest descent, stationary phase, and WKB methods. Fourier and Laplace transforms, Wiener-Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring, odd years, when demand warrants)

\*214 **Measure and Integration Theory** (3)

Ullman and Staff

Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon-Nikodym theorem; measure on product spaces; Fubini theorem.  $L^p$  spaces. Prerequisite: advanced calculus. (Fall)



- \*215 **Introduction to Functional Analysis** (3) Robinson and Staff  
Topological and metric spaces; Tychonoff theorem; completion of a metric space; normed and Banach spaces; linear functionals and operators; Hahn-Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Spring)
- 216 **Banach Algebras and Spectral Theory of Operators** (3) Robinson  
Gelfand theory of commutative Banach algebras; function algebras, Stone-Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone-Weierstrass theorem. (Fall, odd years, when demand warrants)
- 217 **Introduction to Ordinary Differential Equations** (3) Glick  
First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Spring)
- 218 **Topics in Ordinary Differential Equations** (3) Staff
- 219 **Partial Differential Equations** (3) Liverman  
Classical and modern techniques for the exact and approximate solution of PDEs. Separation of variables, Green's functions, variational methods, Hilbert space methods. Prerequisite: advanced calculus. (Spring)
- 220 **Topics in Partial Differential Equations** (3) Liverman
- 221 **Calculus of Variations** (3) Glick
- 222 **Introduction to Numerical Analysis** (3) Gupta  
Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall)
- 223 **Numerical Solution of Ordinary and Partial Differential Equations** (3) Gupta and Staff  
Initial and boundary value problems for ordinary differential equations. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring)
- 224 **Generalized Functions and Integral Transforms** (3) Liverman  
Laplace and Fourier transforms. Generalized functions. Green's functions. Applications to ordinary and partial differential equations. Prerequisite: Math 157 or equivalent.
- 230 **Topics in Analysis** (3) Staff  
Possible topics include, but are not limited to, ergodic theory, dynamical systems, topological groups, topological vector spaces, generalized functions and distributions.
- 231 **Topics in Applied Mathematics** (3) Staff  
Possible topics include, but are not limited to, applications of functional analysis to nonlinear differential equations, calculus of variations, control theory, mathematical programming, applied mathematics for scientists and engineers.
- 232 **Topics in Numerical Analysis** (3) Gupta and Staff  
Numerical methods and software. For science and engineering students. Introduction to the methods, tools, and ideas of numerical computation. Emphasis on problem solving using standard mathematical software, such as IMSL subroutines and Math/Protran. Interpolation; linear, nonlinear, and differential equations. Prerequisite: matrix theory, differential equations, and FORTRAN programming. (Spring)
- 241-42 **Mathematical Foundations of Stochastic Processes** (3-3) Junghenn  
A mathematically rigorous study of conditional probability and expectation, martingales, stopping times, Brownian motion, and Markov processes. Prerequisite: Math 214 or the equivalent.



## COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3)

Partially ordered sets, constructive combinatorics, tableaux, partitions. Prerequisite: Math 113, undergraduate modern algebra and linear algebra, or permission of instructor. (Spring) Simion

262 **Graph Theory** (3)

Graphical enumeration, factors, algebraic graph theory, extremal graph theory, problems ranging from classical results to current research, applications. Prerequisite: Math 113, linear algebra, modern algebra, or permission of instructor. (Fall) Simion

263 **Topics in Combinatorial Mathematics** (3)Staff

## LOGIC

271 **Mathematical Logic** (3)

Model theory: the relation between a formal language (syntax) and its interpretations (semantics). Consistency, completeness, and compactness. Completeness of first-order predicate logic. Elements of recursion theory; decidability. Axiomatic theories. Formal number theory and its nonstandard models. Arithmetical relations. Tarski's theorem on the inexpressibility of truth. Church's undecidability theorem. Gödel's incompleteness theorem and its impact on mathematics and the philosophy of science. (Fall, even years) Harizanov

272 **Topics in Logic** (3)Harizanov

## TOPOLOGY

281-82 **General Topology** (3-3)

General topological spaces, separation axioms, compactness, and connectedness. Metrization, uniform spaces, and complete spaces. (Math 281—fall) Kenyon and Staff

287 **Differentiable Manifolds I** (3)

Differentiable manifolds, tangent vectors, submanifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability. (Fall, even years) Glick

288 **Differentiable Manifolds II** (3)

Manifolds with boundary, integration on manifolds, Stokes's theorem and the divergence theorem, the Brouwer fixed-point theorem, deRham groups, Riemannian manifolds, geodesics, curvature. (Spring, odd years, when demand warrants) Glick

289 **Topics in Topology** (3)

May be repeated for credit. Staff

## RESEARCH

295 **Reading and Research** (3)

May be repeated for credit. Staff

## Fourth Group

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination. Staff

399 **Dissertation Research** (arr.)

Limited to Doctor of Philosophy candidates. May be repeated for credit. Staff



## MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, L.F. Affronti (Chair), M. Reich, P.D. Kind, J.W. Albright, D.T. Kingsbury  
Associate Professor G.V. Stokes

*Master of Science in the field of microbiology*—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11-12; Chem 11-12, 151-52, 153-54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A total of 30 semester hours is required, 24 hours of course work and 6 hours of thesis (Micr 299-300). The course work must include Bioc 221-22 and Micr 277-78. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

*Master of Science in the field of clinical microbiology (supervisory track)*—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221-22; Micr 225-226; Path 230, 231, 232; Micr or Path 294; and Stat 127. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

*Doctor of Philosophy in the field of microbiology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: immunology, pathogenic microbiology (including subdisciplines of bacteriology, parasitology, and mycology), and molecular and cellular biology (including virology, microbial physiology, and genetics).

**211 Microbiology (3)** Staff  
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221-22, or other biochemistry course, and permission of instructor. (Fall)

**212 Pathogenic Bacteriology (3)** Hugh  
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: BiSc 111 or equivalent; Bioc 221-22. Laboratory fee, \$20. (Spring)

**213 Bacterial Pathogenesis (3)** Hugh  
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall)

**214 Tissue Cell Culture (3)** Albright, Bradlaw\*  
Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Bioc 221-22. (Spring)

**215 Parasitology (2)** Turnert  
Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

**219 Scientific Writing (1)** Hugh  
A basis for preparing theses, dissertations, and publications. (Fall, odd years)

\* June Adeline Bradlaw is Adjunct Associate Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.

† Virginia M. Turner is Adjunct Assistant Professor of Parasitology in Microbiology in the G.W.U. School of Medicine and Health Sciences.



- 225 **Microbial Physiology I** (3) Reich, De Giovanni-Donnelly\*  
Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221-22. (Fall)
- 226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly  
The actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular level. Prerequisite: Micr 225 or permission of instructor. (Spring)
- 227 **Microbial Physiology Laboratory** (2) Reich  
The application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, \$20. (Fall)
- 229 **Immunology** (3) Kind, Affronti  
Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen and antibody reactions in vitro and in vivo, and the immune response. Prerequisite: Bioc 221-22. (Fall)
- 230 **Immunology Laboratory** (2) Kind, Affronti  
Emphasis on methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in the microbiology graduate program. Laboratory fee, \$20. (Fall, odd years)
- 231 **Immunobiology** (1) Affronti, Kind  
Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students. Prerequisite: Micr 201+ or 229, and permission of instructor. (Fall)
- 233 **Virology** (3) Stokes  
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Bioc 221-22 or permission of instructor. (Fall)
- 234 **Virology Laboratory** (2) Stokes  
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, \$20. (Fall)
- 235 **Systematic Bacteriology** (2) Hugh  
History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)
- 241 **Survey of Molecular Biology Techniques** (3) Staff  
Laboratory course in the basic techniques of molecular biology as they apply to analysis and manipulation of proteins and nucleic acids. (Spring)
- 250 **Pathogenesis of Microbial Infections** (1) Hugh  
Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection. For medical students, open to graduate students. Prerequisite: Micr 201 or 212 and 213. (Fall)
- 252 **Medical Parasitology** (1) Turner  
Lecture and laboratory course. The life cycles, epidemiology, clinical manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections. In the laboratory, emphasis is placed on the recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens. For medical students; open to graduate students. (Fall)
- 255 **Clinical Virology** (1) Staff  
General principles of virology; emphasis on clinical situations. For medical students; open to graduate students. Prerequisite: Micr 201 or equivalent. (Fall)

\* Rosalie Frances De Giovanni-Donnelly is Adjunct Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.

† For description of Micr 201 see the School of Medicine and Health Sciences Bulletin.



- 258 **Microbial Genetics** (2) De Giovanni-Donnelly  
Survey of microbial systems that depict basic concepts of genetic principles.  
(Spring)
- 260 **Cellular Immunology** (1) Kind  
Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229.  
(Spring)
- 277-78 **Seminar: Microbiology** (1-1) Staff  
Required of graduate students. (Academic year)
- 293 **Special Topics in Microbiology** (arr.) Staff  
Selected topics in microbiology. May be repeated for credit. (Fall and spring)
- 294 **Research in Clinical Microbiology** (3) Staff  
Development and/or evaluation of techniques, procedures, or instrumentation related to clinical microbiology. Limited to students in the master's program in clinical microbiology. Offered jointly by the Microbiology and Pathology Departments.
- 295 **Research in Microbiology** (arr.) Staff  
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

#### MUSEUM STUDIES—GRADUATE PROGRAM

##### Committee on Museum Studies

M.C. Malero (Director), A.D. Andrews, R.L. Humphrey, C.R. Rose, J. Vlach

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. The program is designed for those who seek a deepening of their primary academic interest along with training in the broad range of talents required in the successful operation of museums. The goal of the program is to produce graduates who are prepared to assume museum positions that require both scholarship and functional skills. (Students whose career interests are primarily curatorial should consider applying for the Master of Arts in their academic discipline with a concentration in museum training.)

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences. The student must have an undergraduate major, or its equivalent, relevant to the proposed academic core and at least 9 credit hours in a museum-related field other than the undergraduate major or must show equivalent preparation.

Courses relating to museum studies are offered by other departments of the University, such as Anthropology, American Studies, Art, and Education. With the approval of their advisor, students may draw on these courses in formulating their programs.

The Committee on Museum Studies serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

**Master of Arts in the field of museum studies**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The degree requires a minimum of 42 hours of course work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, history, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies, which may include museum administration,



collections management, exhibiting, and object care and conservation. At least 6 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper.

**201 Introduction to Museum Studies:**

**History and Philosophy of Museums (3)**

Museums viewed from historical, philosophical, and practical perspectives. Examination and comparison of types of collecting organizations. Analysis of contemporary studies on the status of museums and their public programs. (Fall)

P. Spiess

**202 Introduction to Museum Studies: Administration (3)**

Overall operation of the museum: legal status of the museum and its obligations to the public; governance, staffing, policy-making, financial planning. Theory applied to practical situations. (Spring)

Malaro

**203 Fiscal Management of Nonprofit Organizations (3)**

Basic concepts of general accounting; fund accounting for nonprofit organizations; appropriation and encumbrance accounting; budgets and budget systems; use of the budget as a management tool. (Spring)

Olmo

**215 Collections Management: Legal and Ethical Issues (3)**

Establishing collections policies; laws, regulations, conventions, and codes that affect acquisitions, deaccessions, loans, and collection care; accountability; access problems. (Fall)

Malaro

**216 Collections Management: Practical Applications (3)**

The implementation of collections policies: cataloging, documentation, records maintenance, object preservation, storage techniques, handling and shipping, inventory control, data systems. (Spring)

K. Spiess

**270 Curatorial Research and Exhibition Development (3)**

Museum research from a curatorial point of view, with emphasis on exhibit conceptualization and development. Research techniques, information sources, script production. (Fall)

Crouch

**271 Seminar: Museum Exhibiting (3)**

The collaboration between curator and designer. The designer's task as visualizer. Project management of both simple and complex exhibits in various disciplines. Installation techniques. Hypothetical projects developed by student teams. (Spring)

Sims

**291 Museum Internship (3 or 6)**

Individual work experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Director of the Museum Studies Program. Museum internships are supervised by one or more members of the cooperating museum staff in the areas of museum management, object care and conservation, exhibiting. (Fall, spring, and summer)

Malaro

**295 Directed Research (3)**

Individual research on special topics in the museum field. Topics must be approved by the Director of the Museum Studies Program. May be repeated for credit. (Fall, spring, and summer)

Staff

**297 Special Topics in the Museum Field (3)**

May be repeated for credit provided the topic differs. (Fall, spring, and summer)

Staff

**Related courses offered by other departments:**

- AmCv 251 Museum Research and Education
- AmCv/Anth 294 Field and Laboratory Research in Archaeology
- Anth 264 Seminar: Anthropological Museum Techniques
- Art 209-10 Exhibition and Display Design
- Art/Anth 292 Introduction to Conservation
- Art/Anth 293 Preventive Conservation Techniques
- Art/Anth 212 Advanced Conservation Techniques
- Educ 240 Proposal Writing
- Educ/AmCv 286 Interpretation in the Historic House Museum



- Educ 223 Museum Audiences  
 Educ 227 Museum Evaluation  
 TrDa 231 Lighting Design  
 TrDa 234 Advanced Scene Design  
 TrDa 235 Special Projects in Scene Design

## MUSIC

Professors G. Steiner (Emeritus), R. Parris  
 Adjunct Professor G.B. Delente (Piano)  
 Associate Professors N.A. Tilkens, R.J. Guenther (Chair)  
 Adjunct Associate Professor M. Garst (Piano)  
 Assistant Professor C.J. Pickar, D.F. Voelker (Visiting)  
 Adjunct Assistant Professors J.E. White (Voice), S.K. Kim (Piano), J. Albertson (Guitar),  
 F.B. Conlon (Piano), S. Prussing (Voice), M. Sislen (Guitar), A. Lee (Voice), J.D. Levy (Jazz  
 Improvisation)  
 Assistant Professorial Lecturers B. Feinstein, C.M. Dunham, A. Wittrup  
 Studio Instructors M. Findley (Violin), K. Fleming (Cello), P. Gieseler (Voice), E. Guenther  
 (Organ), N.M. Irvine (Bass), S.E. King (Recorder), L. Lipnick (Bassoon), W.H. Mann  
 (Flute), R.J. Pallansch (Tuba), R. Parnas (Violin and Viola), B.R. Seidman (Harp), S.  
 Wellman (Voice), R. White (Oboe), W.R. Wright (Clarinet and Saxophone), W.A. Baugh-  
 man (Trumpet), P. Edgar (Percussion), S.M. Fearing (French Horn), E.C. Thayer (French  
 Horn), E.U. Kiehl (Trombone), D. Marsh (Electric Bass), M. Von Villas (Opera), J. Beck  
 (Percussion), T. Perazzoli (Flute), J. Krash (Piano)

*Bachelor of Arts with a major in music (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Mus 1-2, 5-6; 6 hours of applied music courses in the student's principal performance area.
3. The language competence option listed under General Curriculum Requirements, Columbian College of Arts and Sciences.
4. Required courses in the major—Mus 101-2, 103-4, 131-32, 138, 151; 6 additional hours of applied music courses; a minimum of 4 hours of music ensemble courses. Music majors must meet the departmental requirement for proficiency in piano. All majors are expected to attend and perform regularly in student recitals in accordance with minimum departmental requirements.

*Bachelor of Music*—Admission to the Bachelor of Music degree program requires demonstration of special advanced pre-admission training and aptitude. In addition to the general requirements stated under Columbian College of Arts and Sciences, the 129-credit-hour program requires music courses as follows: Mus 1-2, 5-6, 101-2, 103-4, 131-32, 138-39, 151, 199; 6 hours of ensemble courses; 12 hours of applied music courses; 15 hours of additional courses in the area of concentration (theory or performance); and 5 hours of electives. The departmental requirement of proficiency in piano must be satisfied by the end of the junior year. Students in this program are required to pursue the language competence option listed under General Curriculum Requirements, Columbian College of Arts and Sciences.

*Minor in Music*—20 semester hours of music courses, consisting of Mus 1-2 or 5-6, two music history courses (Mus 101-2 or 103-4), 4 semester hours of piano study, and 2 semester hours of ensemble participation. Students with sufficient piano proficiency, as determined by an audition, may elect another applied music area for concentration. Recital attendance and public performance are required.

*Master of Arts in the field of music*—Prerequisite: a bachelor's degree with a major in music or an equivalent degree; satisfactory demonstration of ability in one medium of performance; demonstration of piano proficiency as required for the Department's bachelors' degrees; completion of the Department's theory placement examination. Applicants



from other institutions must present scores on the Music Subject Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of course work, including a thesis (6 semester hours). This program includes a required core of courses from theory, history, and performance as well as electives that may include up to two approved courses outside the department. A student in this program must demonstrate, by formal examination, a reading knowledge of either French or German before beginning the third semester of study.

*Master of Music in the field of performance (piano or voice)*—Prerequisite: a bachelor's degree with a major in music or an equivalent degree; an audition before a faculty committee. Applicants from other institutions must present scores on the Music Subject Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes 30 semester hours distributed as follows: (a) 12 semester hours of performance study in the area of concentration (piano or voice); (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (6 semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertoire, performed on a professionally accepted artistic level); delivery of a historical and analytical lecture on the musical content of the recital program, also before a designated committee; a written report on some approved theoretical area related to the student's concentration; and demonstrated leadership in an ensemble performance (opera or oratorio for voice).

**Departmental Prerequisites:** Mus 1-2 is prerequisite to all other courses required of music majors with the exception of applied music and ensemble courses. All students majoring in music are required to emphasize performance study in one instrument or voice. Placement auditions to determine the beginning level of study are administered at the time the major is declared. Satisfactory progress in the principal performance area, as determined by the department's repertoire and study-level guidelines and regular applied music jury examinations, is required for continuance in the major. Attendance at a minimum number of public concerts and recitals is required of all music majors as a part of their applied music study.

## MUSIC THEORY, HISTORY, AND LITERATURE

### First Group

#### 1-2 Elements of Music Theory (4-4)

Notation, scales, keys, intervals, terms, rhythms, and chord structure and progression, both written and at the piano keyboard. Aural skills development through melodic, harmonic, and rhythmic dictation and sight singing. Introduction to music literature, with emphasis on rudimentary aural analysis. Two 50-minute lab sessions per week. Mus 1 is prerequisite to Mus 2. (Academic year)

#### 3 Introduction to Musical Understanding (3)

Introductory history of musical styles, related to listening; study of music materials and media. Not open to music majors. (Fall and spring)

#### 4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature. Not open to music majors. (Spring)

#### 5-6 Harmony (4-4)

Triads, inversions; chord analysis, construction, and progression; figured-bass realization, part writing, modulation, altered chords. Prerequisite: Mus 1-2; Mus 5 is prerequisite to Mus 6. (Academic year)

#### 7 Music of Non-Western Cultures (3)

Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa.



- 8 **History of Jazz** (3) Dunham  
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Fall)

## Second Group

- 101-2 **History of Music I** (3-3) Tilkens  
Development of music in the Western world from the early Christian era through the Baroque. Mus 101 is prerequisite to Mus 102. (Academic year)
- 103-4 **History of Music II** (3-3) Tilkens  
Development of Western music from the Classical period to the present. Mus 103 is prerequisite to Mus 104. (Academic year)
- 105 **Computers and Music** (3) Conrad  
Theory and practical computer applications in sound synthesis (both analog and FM digital), MIDI controlling and communication, digital sampling and recording, and manuscript preparation and editing. Music-reading ability is assumed; extensive computer experience and knowledge of electronic music are not required. Prerequisite: Mus 1 or permission of instructor. (Fall)
- 109 **Orchestra Literature** (3) Staff  
Survey of the history and styles of orchestra literature, analysis of representative works.
- 110 **Chamber Music Literature** (3) Staff  
Survey of the history and styles of chamber music literature, analysis of representative works.
- 121 **The Opera** (3) Feinstein  
Survey of the history and styles of opera, analysis of representative works. (Fall)
- 125 **Keyboard Music Literature** (3) Tilkens  
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present. (Fall)
- 131-32 **Advanced Theory** (3-3) Parris  
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5-6 or equivalent. (Academic year)
- 133-34 **Composition** (3-3) Parris  
(Academic year)
- 135 **Counterpoint** (3) Parris  
Study and practice of 16th-century contrapuntal techniques. (Fall)
- 137 **Orchestration** (3) Parris  
Instrumental scoring. (Spring)
- 138-39 **Form and Analysis** (3-3) Parris  
Analysis of musical forms in representative musical literature. (Academic year)
- 151 **Conducting** (3) Wright  
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall)
- 160-61 **Electronic Music** (3-3) Witttrup  
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year)
- 173 **Pedagogy** (3) Staff  
Principles, materials, and methods of teaching in selected areas.
- 175 **Performance Practices in Selected Areas** (3) Garst  
An investigation of the problems of accurate interpretation of music of selected periods through the use of historical and modern literature and its application to the actual music. Topic to be announced in the *Schedule of Classes*. (Fall—odd years)
- 199 **Independent Research** (3) Staff  
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)



## Third Group

- 203 **Bibliography and Research Methodology** (3)  
(Fall) Guenther
- 205 **Music of the Baroque Period** (3)  
Study of the musical styles, techniques, and literature from 1600 to 1750.  
(Fall) Tilkens
- 206 **Music of the Classical Period** (3)  
Study of styles, techniques, and literature from the 18th-century schools through  
Haydn, Mozart, and Beethoven. Tilkens
- 207 **Music of the Romantic Period** (3)  
Study of the musical styles, backgrounds, and literature from Schubert through  
the 19th century. (Fall) Guenther
- 208 **Music of the 20th Century** (3)  
The principal schools, techniques, developments, and trends of the 20th century.  
Von Villas
- 221-22 **Diction for Singers** (3-3)  
Pronunciation and rules of diction for the singing of Italian, French, German, and  
Church Latin, making use of the International Phonetic Alphabet. (Alternate)  
academic years) Parris
- 231-32 **Composition** (3-3)  
May be repeated for credit. (Academic year) Staff
- 234 **Seminar: Performance Practices in Selected Areas** (3) Guenther
- 237 **Seminar: Analytical Studies in Music Theory** (3)  
(Spring) Staff
- 238 **Seminar: Analytical Studies in Music History** (3) Staff
- 239 **Independent Research** (3) Staff
- 251-52 **Advanced Conducting** (3-3)  
(Academic year) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)

## APPLIED MUSIC

Applied music courses are offered both fall and spring, and may be repeated for credit. Mus 51, 52, 53, 54, 55, and 153 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, \$75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, \$150.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors and minors.

## First Group

**Required practice:** three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

- 11 Piano (1)
- 12 Piano (2)
- 13 Voice (1)
- 14 Voice (2)
- 15 Organ (1)
- 16 Organ (2)
- 17 Violin (1)
- 18 Violin (2)
- 19 Classical Guitar (1)

Staff  
Staff  
E. Guenther  
Staff  
Albertson, Sislen



- 20 **Classical Guitar** (2) Parnas
- 21 **Viola** (1) Fleming
- 22 **Viola** (2) Irvine, Marsh
- 23 **Cello** (1) Mann, Perazzoli
- 24 **Cello** (2) King
- 25 **Bass** (1) R. White
- 26 **Bass** (2) Wright
- 27 **Flute** (1) Wright
- 28 **Flute** (2) Wright
- 29 **Recorder** (1) Lipnick
- 30 **Recorder** (2) Fearing, Thayer
- 31 **Oboe** (1) Baughman
- 32 **Oboe** (2) Kiehl
- 33 **Clarinet** (1) Edgar, Beck
- 34 **Clarinet** (2) Seidman
- 35 **Saxophone** (1) Pallansch
- 36 **Saxophone** (2) Wright
- 37 **Bassoon** (1) Staff
- 38 **Bassoon** (2) Pickar
- 39 **French Horn** (1) Wright
- 40 **French Horn** (2) Preparation and performance of orchestral literature. Prerequisite: audition before director.
- 41 **Trumpet** (1) Staff
- 42 **Trumpet** (2) Chamber ensemble groups approved by audition.
- 43 **Trombone** (1) Pickar
- 44 **Trombone** (2) Preparation and performance of choral literature. Prerequisite: audition before director.
- 45 **Percussion** (1) Pickar
- 46 **Percussion** (2) Preparation and performance of chamber vocal literature. Prerequisite: audition before director and two semesters of Mus 53.
- 47 **Harp** (1) Wright
- 48 **Harp** (2) Preparation and performance of classic and contemporary "big band" literature. Prerequisite: audition before director.
- 49 **Tuba** (1) Garst, Parris
- 50 **Tuba** (2) Staff
- 51 **Orchestra** (1) Staff
- 52 **Instrumental Ensemble** (1) Chamber ensemble groups approved by audition.
- 53 **University Singers** (1) Pickar
- 54 **Chamber Choir** (1) Preparation and performance of choral literature. Prerequisite: audition before director and two semesters of Mus 53.
- 55 **Jazz Band** (1) Wright
- 56 **Jazz Band** (2) Preparation and performance of classic and contemporary "big band" literature. Prerequisite: audition before director.
- 57 **Harpsichord** (1) Garst, Parris
- 58 **Harpsichord** (2) Staff
- 59 **Jazz Performance Techniques** (1) Staff
- 60 **Jazz Performance Techniques** (2) Staff

## Second Group

**Departmental prerequisite:** audition to meet departmental requirements.  
**Required practice:** six hours a week for 1-semester-hour courses and 12 hours a week for 3-semester-hour courses. In addition, 3-semester-hour courses include master performance classes and recital preparation.

- 111 **Piano** (1) Staff
- 112 **Piano** (3) Staff
- 113 **Voice** (1) Staff



- 114 Voice (3)
- 115 Organ (1)
- 116 Organ (3)
- 117 Orchestral Instrument (1)
- 118 Orchestral Instrument (3)
- 119 Classical Guitar (1)
- 120 Classical Guitar (3)
- 153 Vocal Theater Workshop (1)

A performance-oriented program for singers of various vocal abilities. May be repeated for credit. In the fall semester the stress will be on development of body awareness for the stage, acting improvisations, and character development. Scenes will be chosen (with the approval of the voice faculty) from the opera, operetta, and musical theater repertoire. In the spring semester, musical coaching, use of makeup, and audition preparation will be included.

- 155 Voice Study for the Theatre (1)
- 156 Voice Study for the Theatre (3)
- 157 Harpsichord (1)
- 158 Harpsichord (3)

E. Guenther

Staff

Albertson, Sisen

Von Villas, Conlon

Staff

Staff

Garst, Parris

### Third Group

All courses include supervised ensemble preparation and required concert solo performances.

- 211 Piano (3)
- 213 Voice (3)
- 215 Organ (3)
- 217 Orchestral Instrument (3)

### NAVAL SCIENCE

Professor O.C. Martin (Chair)

Associate Professor D.M. Hirabayashi

Assistant Professors G. Johnson, J.J. Jackson, F.D. Forney, M.P. Ralph

### Naval Reserve Officers Training Corps Program

The Naval Reserve Officers Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science courses and attend weekly professional seminars. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

**Four-Year Scholarship Program**—Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While enrolled, the government provides tuition, fees, books, uniforms, and an allowance of \$100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation that consists of at least four years of active duty. Scholarship Program students must include courses in English, calculus, computer science, physics, national security policy, a foreign language, technical electives, and naval science in their degree program and participate in three summer training periods of approximately four weeks each.

**Two-Year Scholarship Program**—Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made by the start of the fall semester of the student's sophomore year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and drill, similar to



those required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

**Four-Year College Program**—Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive \$100 per month. Students must include courses in mathematics, science, and naval science in their degree program, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve on graduation with an eight-year active/reserve service obligation, and serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record, and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training. College Program students who demonstrate academic excellence may be nominated for NROTC Scholarships by the Professor of Naval Science. If awarded, the scholarship will be for the remainder of the student's undergraduate enrollment, up to a maximum of three and a half years; service requirements and benefits are the same as for the scholarship programs.

**Two-Year College Program**—Application should be made by the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion may enroll in the program. The benefits and obligations are the same as for the Four-Year College Program.

**Requirements for all candidates**—Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science.

#### **Degree Credit for Naval Science Courses**

**Columbian College**—NSc 126, 160, and 180 are acceptable as history electives. Up to 12 credit hours (for NSc 52, 150, 175, and 176) may be accepted as professional electives in Columbian College.

**School of Education and Human Development**—NSc 126, 160, 175, 176, and 180 may be accepted for social science elective credit in the following undergraduate programs: elementary education, human services, and special education. All naval science courses are acceptable as elective credit in the travel and tourism and exercise and sport science programs.

**School of Government and Business Administration**—NSc 175 and 176 may be used as equivalents for BAd 191 and 110, respectively, by students in both the B.B.A. and B.Acct. degree programs. For B.B.A. students, any other naval science courses may be used to fulfill science, social science, or elective requirements. For B.Acct. students, any one of the remaining naval science courses may be used to fill an elective requirement.

**Elliott School of International Affairs**—NSc 126, 160, and 180 may be used as elective credit in all undergraduate programs.

#### **51 Introduction to Naval Science (3)**

A general introduction to the naval profession and to concepts of sea power. The mission, organization, and warfare components of the U.S. Navy and Marine Corps. Overview of officer and enlisted ranks and rates, training and education, and career patterns. Naval courtesy and customs, military justice, leadership, and nomenclature. Professional competencies required to become a naval officer.



**52 Naval Ships Systems I (Engineering) (3)**

A detailed study of ship characteristics and types, including ship design and control, propulsion, hydrodynamic forces, stability, compartmentation, electrical and auxiliary systems, interior communication, and damage control. Included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting.

**125 Naval Ships Systems II (Weapons) (3)**

Theory and employment of weapons systems, including the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types, including capabilities and limitations. Physical aspects of radar and underwater sound. Facets of command, control, and communications as means of weapons system integration.

**126 Sea Power and Maritime Affairs (3)**

A survey of the U.S. naval history, from the American Revolution to the present, with emphasis on major developments. The geopolitical theory of Mahan. Present-day concerns in sea power and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of U.S. and Soviet naval strategies.

**150 Navigation and Naval Operations I (3)**

An in-depth study of piloting and celestial navigation, including theory, principles, and procedures. Students develop practical skills in both piloting and celestial navigation. The use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. The celestial coordinate system: spherical trigonometry, theory and operation of the sextant, and a step-by-step treatment of the sight-reduction process. Other topics include tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and a day's work in navigation.

**151 Navigation and Naval Operations II (3)**

A study of the international and inland rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

**160 Evolution of Warfare (3)**

This course traces the development of warfare, from earliest recorded history to the present, with focus on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires a basic sense of strategy and develops an understanding of military alternatives and the impact of historical precedent on military thought and actions.

**175 Leadership and Management I (3)**

A comprehensive study of organizational behavior and management in the context of naval organization. Survey of the management functions of planning, organizing, and controlling. Introduction to individual and group behavior in organizations and extensive study of motivation and leadership. Major behavioral theories. Practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics include decision making, communication, responsibility, authority, and accountability.

**176 Leadership and Management II (3)**

A survey of the interaction of leadership, organizational behavior, and human resource management. Employee interviewing and counseling, performance appraisals, business correspondence, military and civilian law, and managerial ethics and values. This capstone course in the naval science curriculum builds on and integrates professional competencies to develop a thorough understanding of the problems and issues faced by leaders, managers, and naval officers.

**180 Amphibious Warfare (3)**

A historical survey of the development of amphibious doctrine and the conduct of amphibious operations. The evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the concept of rapid deployment force.



## PATHOLOGY—GRADUATE PROGRAMS

Professors H. Sidransky (Chair), B.C. Zook (Comparative Pathology)  
Associate Professors S.G. Kent, Y. Al-Doory, C.T. Garrett, J.M. Orenstein, S. Silver, D.S. Wilkinson, G.A. Clawson, A.M. Schwartz

Programs of study leading to the degree of Associate in Science (Medical Laboratory Technique) and Bachelor of Science (Medical Technology) are described in the School of Medicine and Health Sciences Bulletin.

*Master of Science in the field of clinical microbiology (supervisory track)*—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221-22; Micr 225-226; Path 230, 231, 232; Micr or Path 294; and Stat 127. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

*Doctor of Philosophy in the field of pathology*—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted. Qualifying scores on the Aptitude Test (Verbal, Quantitative, and Analytical) of the Graduate Record Examination are required. Some students may be required to take the Biology (Advanced Specific Field) examination as well.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

(Undergraduate programs in medical laboratory technique and medical technology are described in the School of Medicine and Health Sciences Bulletin.)

### 203-4 Pathology (4-4)

Kent and Staff

General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

### 230 Pathology and Pathophysiology of Infections (3)

Silver

An interdepartmental course dealing with the pathophysiology of human response to injury, with emphasis on, but not restricted to, infectious agents. (Fall)

### 231 Laboratory Supervisory Clerkship (1)

Silver

Students will rotate through selected clinical microbiology laboratories (hospital, public health, and commercial) to observe the techniques of supervision employed in each setting. Hospital laboratories will range from small community facilities to large medical center facilities. Generally, students will spend a maximum of one week in each laboratory. The type of clerkship a student is required to fulfill will be determined individually, based on past experience. Open only to degree candidates in the clinical microbiology program. (Fall, spring, and summer)

### 232 Laboratory Management Seminar (1)

Silver

Management techniques related to the clinical microbiology laboratory environ-



- ment. Open only to degree candidates in the clinical microbiology program.  
(Fall and spring)
- 256 **Pathology of Infectious Diseases** (3) Abraham\*  
Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes that occur in infections. Analysis of cases and review of assigned readings. Prerequisite: Micr 211 and Path 203.
- 257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham  
Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261.
- 258 **Organ System Pathology** (5) Staff  
Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring)
- 276 **Seminar in Experimental Pathology** (1) Staff  
Presentations on current topics in experimental pathology. (Fall and spring)
- 283 **Anatomic Pathology Clerkship** (arr.) Staff  
Necropsy and surgical pathology service. Prerequisite: Path 203-4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.
- 286 **Perinatal Pathology** (arr.) Kent  
Course will focus on the important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203, 204, and permission of instructor. (Spring)
- 294 **Research in Clinical Microbiology** (3) Silver  
Development and/or evaluation of techniques, procedures, or instrumentation related to clinical microbiology. Limited to students in the master's program in clinical microbiology. Offered jointly by the Microbiology and Pathology Departments. (Fall, spring, and summer)
- 295 **Comparative Pathology** (arr.) Zook, Montali†  
Participation in veterinary pathology service, including studies of domestic, wild, and laboratory animals. Review of training materials and participation in training sessions. Graduate students receive 5 semester hours of credit for each four-week full-time period. Prerequisite: Path 203-4.
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall)

\* Andreas Andrew Abraham is Associate Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

† Richard J. Montali is Adjunct Associate Professor of Pathology (Comparative Pathology) at the G.W.U. School of Medicine and Health Sciences.



## PHARMACOLOGY

Professors H.G. Mandel (Chair), V.H. Cohn, P. Mazel, J.A. Straw, P. Klubes, F.P. Abramson  
 Professorial Lecturer J. Axelrod  
 Associate Professors K.A. Kennedy, D.C. Perry, R.J. Valentino  
 Assistant Professor S.R. Patierno

**Master of Science in the field of pharmacology**—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Math 31, 32; Chem 11–12, 22, 151–52, 153–54. A course in physical chemistry is also recommended.

**Required:** the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22; Phyl 201, 212; Phar 203, 205, 299–300.

**Doctor of Philosophy in the field of pharmacology**—Required: the general requirements stated under the Graduate School of Arts and Sciences.

**Research fields:** behavioral pharmacology, biochemical pharmacology and toxicology, cancer chemotherapy, carcinogenesis, drug metabolism, drug assay methodology, molecular pharmacology, neuropharmacology, genetic toxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and neuroendocrine pharmacology.

## Second Group

114 **Drugs and the Consumer** (3)

Cohn and Staff

General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3)

Cohn

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

158 **Pharmacology for Health Sciences Students** (4)

Klubes and Staff

For students in allied health programs; open to graduate students with permission of the instructor. Drug disposition; autonomic nervous system, cardiovascular, and gastrointestinal drugs; psychopharmacology; analgesics, sedatives, anti-convulsants; chemotherapy, toxicology, endocrinology. Prerequisite: Anat 115, Phyl 111.

## Third Group

203 **Fundamental Principles of Pharmacology and Toxicology** (3)

Cohn and Staff

Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of the instructor. (Fall)

205 **Pharmacology** (8)

Cohn and Staff

Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)



- 220 **Molecular Events in Toxic Actions** (2) Kennedy  
Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring) Staff
- 222 **Genetic Toxicology** (2)  
The action of chemicals and radiation in the induction of DNA damage and repair in vitro and in vivo and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221-22. (Spring) Staff
- 230 **Special Topics in Toxicology** (arr.)  
Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring) Staff
- 254 **Frontiers in Pharmacology** (1) Mandel and Staff  
Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)
- 258 **Cancer Chemotherapy** (1) Mandel and Staff  
Seminars on mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)
- 259 **Readings: Cancer and Cancer Chemotherapy** (2) Klubes  
Selected readings and discussion of recent advances in cancer and cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years) Mandel
- 269 **Pharmacology Seminar** (1)  
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall)
- 272 **Physiological Disposition of Drugs** (3) Cohn  
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current original literature. (Spring) Prerequisite: Bioc 221-22, Phar 203, or permission of the instructor. Staff
- 273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff  
A description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring) Cohn and Staff
- 275-76 **Advanced Topics in Pharmacology and Toxicology I-II** (1-1)  
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years) Cohn and Staff
- 277-78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1-1)  
Continuation of Phar 275-76. (Alternate academic years) Staff
- 279 **Special Topics in Pharmacology** (arr.)  
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring) Staff
- 280 **Neuropharmacology** (2) Perry, Valentino  
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring) Staff
- 295 **Reading and Research** (arr.)  
May be repeated for credit. (Fall and spring) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)
- Fourth Group**
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)



**399 Dissertation Research** (arr.)

Limited to Doctor of Philosophy candidates. May be repeated for credit.  
and spring)

Staff  
(Fall)

**PHILOSOPHY**

University Professor P.J. Caws  
Professors R.H. Schlagel, R.S. French, W.B. Griffith (Chair)  
Associate Professors R.P. Churchill, J.D. Moreno, A. Altman  
Assistant Professor J.P. Butler  
Adjunct Assistant Professor J.F. Uebelhoer

**Bachelor of Arts with a major in philosophy (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—6 hours selected from art history, music history, or religion; 6 hours in history (Hist 39–40 recommended).
3. Required courses in the major—a minimum of 30 semester hours, including as foundational courses Phil 111, 112, 113, 131, and 152; one course selected from each of the following groups: Group A (normative)—Phil 127, 132, 142, 162; Group B (epistemological)—Phil 121, 151, 153; Group C (contemporary)—Phil 172, 192, 193; plus 6 semester hours of elective second- or third-group courses, selected in consultation with a departmental advisor.

For students expecting to continue in graduate school, it is recommended that they include in their programs of study 12 semester hours of introductory French, German, or Greek language courses.

**Minor in philosophy**—Required: a minimum of 18 semester hours of philosophy courses, including two courses chosen from Phil 51, 52, 111, 112, 113; one course chosen from Phil 127, 131, 132, 133, 135, 142, 162; and one course chosen from Phil 121, 151, 152, 153.

**Minor in applied ethics**—Required: 18 semester hours of philosophy courses, including Phil 51 or 52, and 131 and 132, plus three courses selected from Phil 133, 135, 142, 751 (Current Issues in Bioethics), and (for seniors with permission of the instructor) Phil 231, 235, 242, 245, 262.

**Master of Arts in the field of public policy with a concentration in philosophy and social policy**—An interdisciplinary program that brings the normative, historical, and analytical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Two options are available at the discretion of the faculty: (1) a minimum of 24 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work that does not include a thesis. All students are required to take four courses selected from Phil 231, 242, 245, 255, 262; and, for the public policy core, four courses selected from Stat 111, 183; Econ 217; PSc 203; Psc 244; Stat 129 or CSci 100 (Introduction to Computer Science). Phil 205 is open to all students; it is required of those with insufficient background in philosophy, as determined by the department. Phil 299–300 is required for students electing to write a thesis. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor W.B. Griffith, chair of the department.

**First Group****45 Introduction to Logic** (3)

Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Fall)

Churchill



51-52 **Introduction to Philosophy** (3-3)

Readings from major philosophers and study of their philosophical positions in historical, social, and cultural context. Phil 51: Classical, medieval, and early modern philosophers: Socrates through Locke. Phil 52: Enlightenment, 19th- and 20th-century philosophers: Hume through Sartre. (Academic year)

71 **Philosophy and Literature** (3)

A study of some works of literature (mainly 20th-century novels) that serve as vehicles for the working out, expression, and communication of philosophical ideas. (Spring)

**Second Group**111 **History of Ancient Philosophy** (3)

History of Western philosophy from early Greece, including the Near East, with major emphasis on the Pre-Socratics, Socrates, Plato, and Aristotle. (Fall)

112 **History of Modern Philosophy** (3)

History of Western philosophy of the 17th and 18th centuries; Continental Rationalism and British Empiricism from the scientific revolution through the Enlightenment; major emphasis on Hobbes, Descartes, Spinoza, Locke, Berkeley, Hume, and Kant. (Spring)

113 **19th-Century Philosophy** (3)

European philosophy of the 19th century, with major emphasis on Kant, Hegel, Schopenhauer, Kierkegaard, and Nietzsche. (Fall)

121 **Symbolic Logic** (3)

Formal evaluation of deductive arguments in politics, law, economics, etc. Additional topics: metatheory of deductive systems; modal logics; logic and computers. Prerequisite: some knowledge of propositional logic or permission of instructor. (Spring)

125 **Philosophy of Race and Gender** (3)

An examination of race and gender as social categories that define personal and social identity. Readings from Beauvoir, Fanon, Foucault, Sartre, and a variety of literary narratives. (Fall)

127 **Theories of History and Society** (3)

Major philosophical accounts of the course of history and the origins of society, including Marxist theory and its critics. Problems of how we can explain the past and predict the future. (Spring)

131 **Ethics: Theory and Applications** (3)

Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Fall)

132 **Social and Political Philosophy** (3)

Philosophical theories about how economic, political, legal, and cultural institutions should be arranged. Topics include the meaning and significance of liberty, the legitimate functions of government, the nature of rights, the moral significance of social inequality, and the meaning of democracy. (Spring)

133 **Philosophy, Nonviolence, and War** (3)

Philosophies of nonviolence; logical and moral problems of nuclear deterrence and national defense; doctrine of just war. (Fall)

135 **Ethics in Business and the Professions** (3)

Basic concepts and theories of ethics for analysis of moral issues arising in business and professional practice. (Spring)

142 **Philosophy of Law** (3)

Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality. (Fall)

151 **Science and the Modern World** (3)

Comparison of the cosmological frameworks of Aristotle, Newton, Einstein, and quantum mechanics. Emphasis on changing concepts and methodologies, modes of explanation, and ontological implications. (Fall)

152 **Knowledge and Reality** (3)

Inquiry into the basis and structure of knowledge, the problem of perception and



independent reality, the role of language in knowledge, and the meaning and criteria of truth. Prerequisite: Phil 52 or 112 or permission of instructor. (Spring)

- 153 **Mind, Brain, and Artificial Intelligence** (3) Schlagel  
The mind-body problem in connection with developments in neurophysiology, cognitive psychology, and artificial intelligence. Evaluation of the major philosophical positions: dualism, epiphenomenalism, double-aspect theory, identity theory (reductive physicalism), eliminative materialism, and functionalism. (Spring)

- 162 **Aesthetics** (3) Butler  
The problem of artistic representation and the nature of aesthetic experience as related to the creation, appreciation, and criticism of art. Special emphasis on nonrepresentational works of art and their interpretation. (Spring)

- 172 **American Philosophy** (3) Staff  
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Spring)

- 192 **Analytical Philosophy** (3) Staff  
The dominant movements of recent Anglo-American philosophy—logical positivism, British ordinary language philosophy, and neopragmatism—represented by Russell, G.E. Moore, Wittgenstein, Ryle, Ayer, Goodman, Quine, etc. Prerequisite: One other second-group philosophy course. (Fall)

- 193 **Phenomenology and Existentialism** (3) Caws, Butler  
Kierkegaard's existentialist reaction to Hegel; subjectivity and intentionality in 19th-century thought, leading to Husserl's phenomenology; the philosophy of existence in Heidegger and Sartre; the relation between existentialism and Marxism in the later work of Sartre. Prerequisite: One other second-group philosophy course. (Spring)

- 194 **Structuralism and Hermeneutics** (3) Caws  
Structuralism in linguistics (since Saussure), anthropology (Lévi-Strauss), and literary criticism (Barthes and others) and its implications for philosophy (Foucault). The movement will be assessed in relation to other contemporary philosophical trends, especially the hermeneutics of Gadamer and Ricoeur. Prerequisite: One other second-group philosophy course. (Fall, odd years)

- 199 **Readings and Research** (3) Staff  
(Fall and spring)

### Third Group

- 201-2 **Readings and Research** (3-3) Staff  
Advanced readings and reports. Investigation of special problems. (Academic year)

- 205 **Selected Schools and Problems** (3) Staff  
An advanced review of the rise of modern empiricism, idealism, and pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Offered as the demand warrants)

- 231 **Seminar: Economic Justice** (3) Griffith  
Ethical and economic analysis of equity and efficiency of current U.S. income distribution patterns. Theories of justice; economic theories of distribution; assessment of redistribution policies. (Fall, even years)

- 235 **Ethics and Business** (3) Griffith, Lenn  
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. Same as BAd 291. (Spring)

- 242 **Philosophy, Law, and Social Reform** (3) Churchill  
A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in policy issues, and the ways



legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring, even years)

245 **Seminar: Rights and the Public Interest in Information Policy** (3)

Griffith

Society's requirements for policy data versus rights to privacy; rights to self-expression and access to information; public interest in enhancing balanced discussion (FCC's "fairness doctrine," regulation of advertising, limitation on campaign expenditures). (Fall, even years)

251 **Seminar: Philosophy of Science** (3)

Schlagel

Selected topics. (Fall, odd years)

252 **Seminar: Epistemology** (3)

Schlagel

Critical examination of selected problems or theories of knowledge. even years

(Fall,

Altman

255 **Philosophy of the Social Sciences** (3)

Philosophic issues relating to theory, methodology, and application of the social sciences. (Spring)

Churchill

262 **Seminar: Normative Issues in Foreign Policy** (3)

Selected issues on the complexities of foreign policy from a normative perspective, including the ethics of military intervention, normative constraints on the pursuit of national interest, the protection of human rights, and the democratic control of foreign policy. (Spring, odd years)

Staff

299-300 **Thesis Research** (3-3)

## PHYSICAL SCIENCE

See Chemistry.

## PHYSICS

Professors H.H. Hobbs, O. Bergmann, A.J. Zuchelli, F. Prats, D.R. Lehman (Chair), B.L. Berman

Adjunct Professor L.C. Maximon

Professorial Lecturers A. Ghovanlou, W.D. Lee, J.J. Coyne, R. Eaton III

Associate Professors W.C. Parke, N.K. Khatcheressian, M.F. Taragin, E.P. Harper, W.J. Briscoe, J.R. Peverley

Associate Professorial Lecturers J.W. Lightbody, M. Fatemi, M.T. Shams, M.I. Haftel, J.T. Broach

Assistant Professors A. Mokhtari (Research), K.S. Dhuga, H. Habertzettl

Lecturer A. Chakarji

*Bachelor of Arts with a major in physics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16 (or Phys 21, 5, 22, 6); Chem 11-12; Math 31, 32, 33.
3. Required courses in related area—CSci 100; Math 111-12.
4. Required courses in the major—Phys 151-52, 161, 162, 163, 164, 165-66, 167, 168, 195.

*Bachelor of Science with a major in physics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16, (or Phys 21, 5, 22, 6, and 16 or 167); Chem 11-12; Math 31, 32, 33.
3. Required courses in related area—CSci 100; Math 111-12.
4. Required courses in the major—Phys 151-52, 163, 164, 195-96, plus three additional 100-level courses chosen with consent of departmental advisor.

For graduation with Special Honors, a student must register for Phys 195 by the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in physics as evaluated by the faculty.



Minor in physics—Required: Phys 13, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The master's degree program with thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 30 semester hours of course work in physics, including Phys 211, 212, 213–14, 221–22, 299–300; plus two of the following: Phys 224, 225–26, 231, 233, 243, 244.

2. The master's degree program without thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work in physics and mathematics including Phys 211, 212, 213–14, 221–22; plus two of the following: Phys 224, 225–26, 231, 233, 243, 244.

A reading knowledge of a foreign language, or the successful completion of CSci 100 with a grade of A or B, is a further requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements stated under the Graduate School of Arts and Sciences, and the successful completion of one of the two following options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of CSci 100 with a grade of A or B.

Research fields: nuclear physics—experimental and theoretical studies on the structure, electromagnetic interactions and scattering of few-body systems at low and intermediate energies, and solid-state physics—crystal growth and physical properties of whiskers.

#### First Group

##### 1 General Physics I (3)

Briscoe, Parke

Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

##### 2 General Physics II (3)

Briscoe, Parke, Zuchelli

Lecture (2 hours), recitation (1 hour). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent.

##### 5 General Physics Laboratory I (1)

Zuchelli

Laboratory complement of Phys 1 and 21. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 1 or concurrent registration in Phys 21. Laboratory fee, \$20.

##### 6 General Physics Laboratory II (1)

Mokhtari, Zuchelli

Laboratory complement of Phys 2 and 22. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 2 or concurrent registration in Phys 22. Laboratory fee, \$20.

##### 9 Introduction to Astronomy I (3)

Hobbs

Classical through modern astronomy, with introduction to basic principles underlying astronomical systems and observations. Lectures cover electromagnetic radiation, optical instruments, and the solar system. Laboratory (2 hours) emphasizes optics and astronomical measurements. Prerequisite: High school algebra. Laboratory fee: \$15. (Fall)

##### 10 Introduction to Astronomy II (3)

Hobbs

Continuation of Phys 9. Stellar and extragalactic astronomy, including introduction to quantum aspects of electromagnetic radiation and atomic physics, stellar spectra, and stellar evolution. Laboratory (2 hours) has the same emphasis as in Phys 9. Prerequisite: Phys 9 or equivalent. Laboratory fee, \$15. (Spring)

##### 11–12 Introduction to Astronomy (2–2)

Hobbs

Same as Phys 9–10 without the laboratory. (Academic year)



### 13 General Physics for Engineering and Applied Science (3)

Lecture (3 hours), recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Topics include geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, \$20.

### 14 Mechanics and Thermal Physics (3)

Lecture (3 hours), recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Topics include collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, the ideal gas, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 13; Math 31. Laboratory fee, \$20.

### 15 Electricity and Magnetism (3)

Lecture (3 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss's Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14; Math 31. Laboratory fee, \$20.

### 16 Modern Physics (3)

Lecture (3 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of special relativity and quantum theory. Topics include relativistic kinematics and dynamics, wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, \$20.

### 21 University Physics I (3)

Lecture (2 hours), recitation (1 hour). Physical concepts and principles are developed using calculus. Topics include classical mechanics, heat, waves, and optics. Concurrent registration in Phys 5 is required. Prerequisite or concurrent registration: Math 31. (Fall)

### 22 University Physics II (3)

Lecture (2 hours), recitation (1 hour). Continuation of Phys 21. Topics include electric and magnetic phenomena, relativity, atomic and nuclear physics. Concurrent registration in Phys 6 is required. Prerequisite: Phys 21; prerequisite or concurrent registration: Math 32. (Spring)

## Second Group

### 121 Modern Cosmology (3)

Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

### 151-52 Intermediate Laboratory (3-3)

Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, \$15. (Fall and spring)

### 161 Mechanics I (3)

Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

### 162 Mechanics II (3)

Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

### 163 Physical and Quantum Optics (3)

Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.



- 164 **Thermodynamics** (3) Parke, Taragin  
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.
- 165-66 **Electromagnetic Theory** (3-3) Zuchelli  
Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electromagnetic waves and radiation.
- 167 **Principles of Quantum Physics** (3) Briscoe, Prats  
Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.
- 168 **Applied Quantum Physics** (3) Briscoe, Prats  
Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular, and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.
- 170 **Elementary Solid-State Physics** (3) Khatcheressian  
Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.
- 175 **Nuclear Physics** (3) Berman, Lehman  
Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.
- 195-96 **Undergraduate Research** (3-3) Briscoe, Taragin  
Research on problems approved by the staff. For the B.A. option, emphasis will be placed on advanced laboratory experience. For the B.S. option, the two semesters will involve advanced laboratory experience and applications of computers in the solution of physics problems, respectively.

### Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

- 211 **Advanced Mechanics** (3) Ghovanlou, Taragin  
Analytic methods of mechanics as a basis for modern theory; variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.
- 212 **Special Relativity** (3) Bergmann  
Application of relativistic concepts to the basic fields of physics; space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.
- 213 **Electromagnetic Theory: Macroscopic Effects** (3) Harper  
Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.
- 214 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Harper  
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving



- charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.
- 221-22 **Quantum Mechanics (3-3)** Prats  
General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations, and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)
- 224 **Statistical Mechanics (3)** Peverley  
Study of classical and quantum-equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.
- 225-26 **Laboratory (3-3)** Hobbs, Briscoe  
Individual work on special topics. Laboratory fee, \$20 per semester. (Academic year)
- 231 **Quantum Electrodynamics: Theory and Applications (3)** Lehman  
A presentation of the lower-order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.
- 232 **Quantum Field Theory (3)** Bergmann, Lehman  
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S matrix, dispersion relations, and renormalization program.
- 233-34 **Nuclear Theory (3-3)** Prats, Lehman  
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics, weak interactions, and electromagnetic interactions.
- 243 **Solid-State Physics: Structure and Binding (3)** Khatcheressian, Hobbs, Peverley  
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.
- 244 **Solid-State Physics: Electronic Processes in Metals (3)** Khatcheressian, Peverley  
Phenomena in metals and semiconductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.
- 250 **Selected Topics in Modern Physics (3)** Staff  
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)
- 291 **Seminar (1)** Staff  
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)
- 299-300 **Thesis Research (3-3)** Staff  
(Fall and spring)

#### Fourth Group

- 398 **Advanced Reading and Research (arr.)** Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)
- 399 **Dissertation Research (arr.)** Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)



## PHYSIOLOGY—GRADUATE PROGRAMS

Professors R.A. Kenney (Chair), M.E. Tidball, M.M. Cassidy, M.J. Jackson, J.J. Bernstein (Research), K.L. Becker, W.B. Wegliki

Associate Professors R.A. Lavine, D.W. Watkins, J.K. Kelleher (Research)

**Master of Science in the field of physiology**—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 hours of required work include Phyl 201, 205, 212, 221, and 298, in addition to the thesis.

**Doctor of Philosophy in the field of physiology**—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a supporting field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination includes Phyl 201, 205, 212, 221, 298, 396, 397.

**Research fields and areas of study:** applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

**Departmental prerequisite:** Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201, except Phyl 205, 221, and 212.

### Second Group

- 191 **Selected Topics in Human Structure and Function** (3) Kenney  
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

### Third Group

- 201 **Physiology** (8) Staff  
Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of chairman of department. Concurrent registration in Phyl 212 is required. Open to Consortium students only with permission of chairman of department. (Spring)
- 205 **Cell Biophysics** (2) Staff  
Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)
- 212 **Neurobiology** (3) Staff  
Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, \$25. (Spring)
- 221 **Seminar** (1) Cassidy  
Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)
- 253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy  
Discussion of principles of fluid and acid-base balance and their applications. (Fall)



- 262 **Topics in Cardiovascular Physiology** (2)  
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall) Kenney
- 269 **Topics in Neurophysiology and Psychophysiology** (2)  
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall) Lavine
- 295 **Research** (arr.)  
By special arrangement with individual staff members. Approximately four hours per week in the laboratory for each semester hour of credit. May be repeated for credit. (Fall and spring) Staff
- 298 **Comprehensive Physiology** (5)  
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring) Staff

#### Fourth Group

- 396 **Advanced Reading and Research** (2)  
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's supporting field. This course satisfies the requirement for Part II of the Cumulative General examination in Physiology. (Fall and spring) Staff
- 397 **Development of Dissertation Problem** (2)  
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Staff

#### POLISH

See **Slavic Languages and Literatures**.

#### POLITICAL COMMUNICATION

##### Committee on Political Communication

J.B. Manheim (Director), W.C. Adams, R.S. French, S.G. Larson, J.A. Morgan, W.M. Reynolds, P. Robbins, J.E. Thiel

Columbian College of Arts and Sciences offers an interdepartmental program in political communication leading to the degree of Bachelor of Arts. Enrollment into the major is restricted; contact the program office for details.

The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses: one course chosen from Stat 53, 91, 105 (Stat 53 is usually preferred); PSc 1, 2; Econ 1 or 2; Comm 133; Jour 72.
3. Required courses in the major:
  - (a) PCm 100, 199; Comm 100, 130; Jour 111; PCm/PSc 103; PSc 120.
  - (b) Four courses selected from the following, at least two of which must be courses other than political communication: PCm 150, 191, 192, 195; Jour/PSc 128; Comm/Jour/PSc 129; Comm 175, 181, 184; Jour 146, 198.
  - (c) Four additional second-level courses offered by the Departments of Communication, Journalism, and/or Political Science.

**Special Honors**—Students with a grade-point average of at least 3.5 in all course work



completed at this institution and in all courses required for the major may declare for Special Honors at the beginning of the senior year. To achieve Special Honors, the student must maintain the stated grade-point requirements and present a successful oral defense of a research paper prepared for the Senior Seminar in Political Communication before an interdisciplinary committee that includes the program director and two other faculty members nominated by the student and approved by the program director. It is recommended that students declaring for Special Honors take PCm 195 in the first semester of the senior year and PCm 199 in the second semester.

**100 Introduction to Political Communication (3)**

Basic concepts and theories of political communication; development of a framework for analyzing political communication; applications in the United States, other countries, and the international system. Limited to political communication majors.

**103 Political Communication Research (3)**

Manheim

Strategies and techniques of empirical research with application to the study and practice of political communication. Same as PSc 103. Students may not receive credit for both PCm/PSc 103 and PSc 101. Prerequisite: PCm 100. (Fall)

**150 Selected Topics in Political Communication (3)**

Topics announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Prerequisite: PCm 100 or permission of the program director.

**191-92 Field Experience (3-3)**

Open to juniors and seniors majoring in political communication. Students spend at least 16 hours a week during the semester in an approved agency or office performing practical work in the subject under the general guidance of a faculty advisor. Grades are assigned on a pass/no pass basis only.

**195 Independent Study (1 to 6)**

The student pursues a program of directed reading or original research under the direction of a faculty advisor. Limited to seniors or exceptionally well-prepared juniors majoring in political communication. Before registering, the student must obtain approval of a written plan of study by the faculty member who will direct the study and the program director.

**199 Senior Seminar in Political Communication (3)**

Limited to majors in political communication. Selected reading and discussion with possible fieldwork in the professional subject.

## POLITICAL SCIENCE

Professors H.L. LeBlanc, B. Nimer, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich (Chair), Y.C. Kim, S.J. Wayne, J.M. Logsdon, W.H. Lewis, C.A. Linden, H.R. Nau, M.A. East, J.B. Manheim, C. McClintock

Associate Professors C.F. Elliott, J.R. Henig, M.J. Sodaro, S.L. Wolchik, R.W. Rycroft, C.J. Deering, C.C. Joyner, H.B. Feigenbaum, J.H. Lebovic

Assistant Professors R.P. Stoker, J.P. Rogers, V. Coleman, S.G. Larson, N.J. Brown, S.L. Wiley

Adjunct Assistant Professor R. Hollis

**Bachelor of Arts with a major in political science (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite: PSc 1 and 2 (or the equivalent). Six courses in the social sciences, other than political science, to include 6 hours of history or 6 hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.
3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement that consists of 6 semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 110; Group B (American government and politics)—PSc 111, 112, 114, 115, 116, 117, 118, 119, 120, 122, 124, 129; Group C (comparative government and politics)—



PSc 130, 131, 146, 168, 170, 173, 177, 179, 180, 181, 183; Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 161, 175, 176, 178, 182, 184, 186.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete a proseminar or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the written permission of the instructor and the undergraduate coordinator.

The department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied toward a degree. No more than 3 hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program must receive grades of A in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements stated under Regulations and take at least one political science honors seminar in which an independent study project is completed with distinction. The student must complete the seminar before the final semester of course work. The project is evaluated by a Departmental Honors Committee, which can recommend graduation with Special Honors in political science. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, have achieved a quality-point index in the major of at least 3.3, and be juniors or seniors.

**Minor in political science**—Required: PSc 1 and 2 (or the equivalent) plus 15 semester hours of second-group political science courses, including a distribution requirement of one course from each of the four groups listed in item 3 above. A minimum of 9 semester hours of other social science courses is also required.

**Master of Arts in the field of political science**—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements stated under the Graduate School of Arts and Sciences and either (1) a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or (2) two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to 6 semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies.

**Doctor of Philosophy in the field of political science**—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences. Each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from five principal subject-matter divisions. Each subject-matter division has several subfields of study from which



the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, comparative communist systems, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, and state, local, and urban politics); and (5) public policy (methods of public policy analysis, science policy, domestic policy analysis, and national security policy). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

**Departmental prerequisite:** PSc 1 and 2 (or the equivalent) are prerequisite to all second-group courses in political science.

- 1 **Introduction to Comparative and International Politics** (3) Sodaro, Feigenbaum, Rogers, Brown  
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)
- 2 **Introduction to American Politics and Government** (3) Wayne, Rycroft, Coleman, Larson  
Structure, powers, and processes of the American political system and the impact on public policy. (Fall and spring)
- 3-4 **Introduction to Political Behavior** (6-6) Staff  
Role of personal and social values in political behavior. Fall: Focus on problems in the American liberal tradition. Spring: A comparative perspective on democratic and authoritarian governments in the 20th century. Admission by special selection process. (Academic year)
- 50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team  
Same as AmCv/Hist/U&RP 50.
- 101 **Scope and Methods of Political Science** (3) Kim, Lebovic, Stoker, Wiley  
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)
- 102 **Empirical Political Analysis** (3) Wiley  
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)
- 103 **Political Communication Research** (3) Manheim  
Same as PCm 103. Students may not receive credit for both PCm/PSc 103 and 101.
- 104 **Methods of Public Policy Analysis** (3) Henig, Stoker  
Introductory overview of the concepts, issues, and techniques of systematic policy analysis and its role in the policy process. (Fall and spring)
- 105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden  
Foundations of Western political thought—Plato to Aquinas. (Fall)
- 106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden  
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Spring)
- 107 **Issues in Modern Political Thought** (3) Linden, Wolchik  
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall and spring)
- 108 **Marxism-Leninism** (3) Elliott  
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on Marx, Engels, and Lenin, and consideration of Bernstein, Rosa Luxemburg, Lukacs, Trotsky, and Stalin. (Spring)



- 110 **American Political Thought** (3)  
Political thought in the U.S. from colonial times to the present as seen through major representative writings. (Spring) Morgan
- 111 **State and Urban Politics** (3)  
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall) Henig
- 112 **State and Urban Policy Problems** (3)  
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring) Henig
- 114 **U.S. Constitutional Law and Politics I** (3)  
Separation of powers, federal-state relationships, economic regulation. (Fall) Morgan
- 115 **U.S. Constitutional Law and Politics II** (3)  
Political and civil rights. (Spring) Morgan
- 116 **The American Presidency** (3)  
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance in office. (Fall and spring) Wayne Rycroft
- 117 **Public Administration and Bureaucratic Politics** (3)  
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Fall) Deering
- 118 **Legislative Process** (3)  
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive-legislative relations and interest-group activities. (Fall and spring) LeBlanc
- 119 **U.S. Political Parties and Politics** (3)  
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring) Wiley
- 120 **Public Opinion and Political Socialization** (3)  
Sources of mass political attitudes and behavior; voting and political campaigning. (Fall) Logsdon, Rycroft
- 122 **Science, Technology, and Politics** (3)  
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring) Larson
- 124 **Issues in Domestic Public Policy** (3)  
Examination of the decision-making process and the substance of various issues in domestic public policy in such areas as crime, economics, education, energy, the environment, poverty, and health. (Fall and spring) Deering, Stoker, Coleman
- 128 **Governmental Processes and the News Media** (3)  
Same as Jour 128. Staff
- 129 **TV News: The Politics of Visibility** (3)  
Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. Same as Jour/Comm 129. (Fall and spring) Feigenbaum, McClintock
- 130 **Comparative Government and Politics I** (3)  
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring) Sodaro, Wolchik
- 131 **Comparative Government and Politics II** (3)  
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring) Sodaro, Joyner, Lebovic, Brown
- 140 **International Politics** (3)  
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring) Stambuk
- 142 **International Organizations** (3)  
Development and operations of the United Nations, regional organizations, functional international organizations. (Fall and spring)



- 144 **Public International Law** (3) Joyner  
Survey of international law, with emphasis upon law's conceptual development and practical application to contemporary international issues. (Fall and spring)
- 146 **U.S. Foreign Policy** (3) Sapin, Rogers  
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)
- 149 **Military Force and Foreign Policy** (3) Sapin, Lewis  
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall and spring)
- 161 **European-Atlantic Relations** (3) Stambuk  
International politics of the North Atlantic area, the European Common Market, and U.S.-European relations. (Fall)
- 168 **Soviet Foreign Policy** (3) Elliott  
Relations with U.S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)
- 170 **Governments and Politics of Northeast Asia** (3) Hinton  
Political institutions and processes of China (including Taiwan), Japan, and Korea since World War II. Influence of indigenous traditions and foreign contacts. (Fall, even years)
- 173 **Governments and Politics of South and Southeast Asia** (3) Hinton  
Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall, odd years)
- 175 **International Relations of East Asia** (3) Kim  
Analysis of the foreign policies of selected East Asian countries and the foreign policies of major powers toward the region. (Fall)
- 176 **The Arab-Israeli Conflict** (3) Reich  
Origins, evolution, and issues of the Arab-Israeli conflict. (Spring and summer)
- 177 **Governments and Politics of the Middle East** (3) Reich, Brown  
Politics of the eastern Arab states, Turkey, Iran, and Israel. (Fall)
- 178 **International Relations of the Middle East** (3) Reich, Brown  
Analysis of the regional and international relations of the Middle East. (Spring)
- 179 **Israeli Politics and Foreign Policy** (3) Reich  
Examination of the institutions, processes, and issues of Israeli politics and foreign policy. (Fall)
- 180 **Governments and Politics of North Africa** (3) Lewis  
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)
- 181 **Politics of Middle and Southern Africa** (3) Nimer  
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)
- 182 **African International Politics** (3) Nimer  
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181. (Spring)
- 183 **Governments and Politics of Latin America** (3) McClintock  
Political processes and institutions of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall)
- 184 **International Relations of Latin America** (3) McClintock  
U.S.-Latin American relations and foreign policies of selected states. (Spring)
- 186 **U.S. Policies Toward Sub-Saharan Africa** (3) Nimer  
Analysis and evaluation of contemporary U.S. policies and policy-making to-



- ward selected areas and individual countries of sub-Saharan Africa: the Horn of East Africa, western Indian Ocean states, southern Africa, Zaire, Nigeria, and Ivory Coast. (Summer) LeBlanc
- 187 **Internship: Political Behavior** (3)  
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. Admission requires departmental approval. (Fall and spring) Henig
- 188 **Internship: Urban Affairs** (3 or 6)  
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring) Staff
- 190 **Selected Topics in Political Science** (3)  
(Fall and spring) Nau
- 191 **Internship: International Affairs** (3 to 9)  
Faculty-supervised internships in the Department of State, Organization of American States, and other international affairs agencies. Admission by approval of instructor. (Fall and spring) Staff
- 192 **Proseminar: Political Science** (3)  
Examination of selected problems in political science. Admission requires departmental approval. (Fall and spring) Henig
- 193 **Proseminar: Urban Affairs** (3 or 6)  
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring) Staff
- 196 **Honors Seminar: Political Theory** (3)  
Research on selected topics. Prerequisite: PSc 101. Admission requires departmental approval. Staff
- 197 **Honors Seminar: American Government and Politics** (3)  
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101. Staff
- 198 **Honors Seminar: Comparative Government and Politics** (3)  
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101. Staff
- 199 **Honors Seminar: International Politics** (3)  
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101. Staff
- 200 **Introduction to Political Analysis** (3)  
Alternative approaches to political analysis, construction of research designs, and problems of measurement. (Fall and spring) Wiley
- 201 **Empirical Political Analysis** (3)  
Techniques of social science data analysis, with emphasis on statistics and computer applications. PSc 200 or other previous introductory research training is highly desirable. (Spring) Wiley
- 202 **Advanced Topics in Empirical Political Analysis** (3)  
Advanced techniques of data collection and analysis; varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. (Offered as the demand warrants) Stoker
- 203 **Approaches to Public Policy Analysis** (3)  
Empirical and normative foundations of systematic policy analysis: concepts, theories, models, issues, strengths, limitations, and uses and misuses in the policy process. (Fall) Stoker
- 204 **Methods of Public Policy Analysis** (3)  
Quantitative and qualitative techniques of systematic policy analysis, such as forecasting, cost-benefit analysis, simulation, operations research, social indicators, and quasi-experimental methods. Prerequisite: PSc 203 or equivalent. (Spring)



- 205 **Readings in Political Theory** (3) Linden  
Selected major works, both ancient and modern, that illuminate basic problems and questions of political theory. (Fall)
- 206 **Topics in Political Theory** (3) Linden  
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)
- 207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik  
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall)
- 208 **Readings in Marxism-Leninism** (3) Elliott, Linden  
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)
- 210 **American Political Process** (3) Deering  
A survey of American political institutions, processes, and behavior. (Fall, even years)
- 211 **State and Urban Politics** (3) Henig  
Comparative analysis of the context, institutions, processes, and policies of state and urban political systems. (Fall)
- 212 **State and Urban Policy Problems** (3) Henig  
Analysis of public policy issues confronting state and urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime. (Spring)
- 214 **Topics in Constitutional Law** (3) Morgan  
Lectures and group discussions on constitutional law and politics.
- 215 **Judicial Policy-Making** (3) Morgan  
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues.
- 216 **American Presidency** (3) Wayne  
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of contemporary policy-making. (Spring)
- 217 **Bureaucratic Politics** (3) Rycroft  
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)
- 218 **Legislative Politics** (3) Deering  
Theory, structure, and process of the U.S. Congress, with emphasis on member-constituency relations, individual and collective decision making, party and committee activities, executive-legislative relations, and interest-group activities. (Fall, odd years)
- 219 **American Political Parties and Elections** (3) LeBlanc  
Nature and functions of American political parties: organizational status, nominating and electoral politics, and role in governing.
- 220 **Public Opinion and Political Socialization** (3) Wiley  
Sources and dynamics of public opinion and political socialization. (Spring)
- 221 **Interest-Group Politics** (3) Deering, Coleman  
Theory, structure, and activities of interest groups in American politics.
- 222 **Science, Technology, and Public Affairs** (3) Logsdon, Rycroft  
Introduction to the study of science, technology, and public policy; focus on policy issues that arise from interactions between scientific and technological developments and government activity. (Fall)
- 223 **Science, Technology, and Public Policy** (3) Logsdon, Rycroft, Nau  
Research and intensive analysis of selected policy issues with significant scientific or technological aspects. Prerequisite: PSc 222, 252. (Spring)
- 224 **Domestic Policy Analysis—Selected Topics** (3) Coleman  
Analysis of U.S. policy toward selected domestic problems.
- 225 **Budgetary Policy** (3) Staff  
Analysis of selected topics in U.S. monetary and fiscal policy. Offered off campus only.



- 226 **Budgetary Politics** (3)  
Examination of economic policy-making in the United States, with emphasis on major participants and the budget process. Offered off campus only. Staff
- 227 **Electoral Laws and Financial Practices** (3)  
State statutes; registration and filing procedures; federal campaign finance legislation, compliance procedures, and enforcement. Staff
- 228 **Media and Politics** (3)  
Role of the media in American politics, with emphasis on television news coverage, political debates, political advertising, and their impact on the electorate. Larson
- 230 **Comparative Government and Politics I** (3) Kim, McClintock, Feigenbaum  
Examination of basic approaches to comparative politics. (Fall)
- 231 **Comparative Government and Politics II** (3) Kim, McClintock, Feigenbaum  
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)
- 232 **Comparative Communist Systems I** (3)  
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. Same as Hist 232. (Fall) Wolchik
- 233 **Comparative Communist Systems II** (3)  
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. Same as Hist 233. (Spring) Wolchik
- 234 **Comparative Legislative Systems** (3)  
Selected problems of legislative theory and behavior from a comparative perspective, with particular reference to the parliamentary systems of West Germany, France, and Britain. Offered off campus only. Staff
- 238 **U.S. Foreign Economic Policy** (3)  
Exploration of ideas and issues involved in U.S. foreign economic policy, including relationship of economic and security issues, interdependence, protectionism, role of the dollar, industrial policy, and the debt crisis. (Fall) Nau
- 239 **U.S. Foreign Economic Policy-Making** (3)  
Research seminar focusing on domestic interests and the policy process in U.S. foreign economic policy-making, including business, labor, and public interest groups, the interagency process, and the role of the President. (Spring) Nau
- 240 **Theories of International Politics I** (3)  
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall) Nimer, Lebovic, East
- 241 **Theories of International Politics II** (3)  
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring) Nimer, Lebovic, East
- 242 **Problems in International Organizations I** (3)  
Collective security, law, and the politics of international organizations. (Fall) Stambuk
- 243 **Problems in International Organizations II** (3)  
Social and economic interdependence and the politics of international organizations. (Spring) Stambuk
- 244 **International Law I** (3)  
The sources and development of international law, with special attention given to current trends and future problems. (Fall) Joyner
- 245 **International Law II** (3)  
Critical examination of selected contemporary problems of world order, e.g. legal issues involving global resource regimes, economic development, and human rights. (Spring) Joyner
- 246 **U.S. Foreign Policy-Making** (3)  
Patterns and problems in contemporary U.S. foreign policy-making. Attention to domestic political factors as well as relevant institutions and agencies. (Fall) Sapin, Rogers
- 247 **U.S. Foreign Policy** (3)  
The substance of contemporary U.S. foreign policy: major problems, concepts, and lines of development since World War II. (Spring) Sapin, Rogers



- 248 **U.S. National Security Policy-Making** (3) Sapin, Lewis, Rogers  
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)
- 249 **U.S. National Security Policy** (3) Sapin, Lewis, Rogers  
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)
- 250 **Foreign Policy Analysis—Selected Topics** (3) Staff  
Analysis of U.S. foreign policy toward selected world regions.
- 252 **Science, Technology, and International Affairs** (3) Nau  
Exploration of implications of technological change for international politics and influence of foreign policy interests on international technological development. (Spring)
- 253 **Defense Policy and Program Analysis I** (3) Staff  
Analysis of U.S. defense budget, force posture, and program priorities. Methodology for defense planning and program evaluation. Special attention to strategic nuclear forces. (Fall)
- 254 **Defense Policy and Program Analysis II** (3) Staff  
Analytical methodology for defense policy and program choices. Special attention to U.S. general purpose forces, including forces for NATO/Europe. (Spring)
- 255-56 **Applied Quantitative Techniques** (3-3) Staff  
The application of quantitative techniques in the solution of issues in defense policy. (Academic year)
- 257 **Arms Control and Disarmament** (3) Staff  
Major issues and trends in the postwar development of U.S. arms control and disarmament policy. (Spring)
- 258 **Communist Party of the Soviet Union** (3) Sodaro  
Analysis of the internal evolution of the Communist Party and its role in the Soviet system from its origins to the present day. Same as Hist 258. (Spring)
- 260 **Western European Politics** (3) Feigenbaum  
Examination of the principal characteristics of the British, French, West German, and Italian political systems, comparing their institutional and behavioral adaptations to the problems of advanced industrial democracies. (Fall)
- 261 **Politics of the European Community** (3) Stambuk  
Problems in Western European politics, with emphasis on supranational political processes and selected policy outcomes in the context of the European Common Market. (Spring)
- 262 **The Political Economy of Western Europe** (3) Feigenbaum  
An examination of the relationships between economic interests and politics as they affect the societies of Western Europe. Selected issues of public policy are discussed. (Spring)
- 263 **The Soviet Union and Europe** (3) Sodaro  
Soviet foreign policy toward Western and Eastern Europe, including its economic and military dimensions. (Fall)
- 264 **Governments and Politics of Eastern Europe** (3) Wolchik  
Comparative analysis of domestic political processes and policies in Eastern Europe. (Fall)
- 265 **The International Politics of Eastern Europe** (3) Wolchik  
Major historical, political, social, and regional factors that have shaped the interwar, World War II, and postwar evolution of Eastern Europe; emphasis on foreign relations with outside powers and on regional East-West contacts. (Spring)
- 266 **Readings in Soviet Government and Politics** (3) Elliott, Linden  
Readings in contemporary Soviet domestic government and politics. (Fall)
- 267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchik  
Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)



- 268 **Soviet Foreign Policy** (3)  
External problems and policies of the U.S.S.R., with emphasis on the period since Khrushchev. Relations with communist states, Western powers, Third World countries, and nonruling communist parties. (Spring) Elliott
- 269 **Soviet Military Policy and Strategy** (3)  
Developments in Soviet military policy and strategy. Emphasis on party-military relations, the decision-making process, manpower problems, structure of the Soviet armed forces, and the external role of the Soviet military. (Fall and spring) Elliott
- 270 **Politics of the People's Republic of China I** (3)  
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall) Hinton
- 271 **Politics of the People's Republic of China II** (3)  
Research seminar. Introduction to the analysis of official Chinese documents and other primary materials. Presentation of student papers. Prerequisite: PSc 270 or equivalent. (Spring, even years) Hinton
- 272 **Foreign Policy of the People's Republic of China** (3)  
Objectives; formulation and implementation; the People's Republic of China as Asian state, revolutionary influence, would-be great power. (Spring) Kim
- 274 **Governments and Politics of Japan and Korea** (3)  
(Formerly PSc 276)  
Readings and research on the domestic and foreign policies of Japan and North and South Korea. (Fall or spring) Hinton
- 275 **International Politics of East Asia** (3)  
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Spring, odd years) Reich
- 276 **The Arab-Israeli Conflict** (3)  
Readings and research on the origins, evolution, and issues of the Arab-Israeli conflict. (Spring) Reich, Brown
- 277 **Governments and Politics of the Middle East** (3)  
Readings and research on selected problems of the governments and politics of the Middle East. (Fall) Reich, Brown
- 278 **International Relations of the Middle East** (3)  
Readings and research on the regional and international relations of the Middle East. (Spring) Reich
- 279 **The Powers in the Middle East** (3)  
The role of the powers in the Middle East, with emphasis on the policies of the United States and the Soviet Union. Consideration is given to other major European and Asian powers. (Fall) Reich, Lewis
- 280 **Governments and Politics of North Africa** (3)  
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Fall) Nimer
- 281 **Topics in African Politics** (3)  
Readings, research, and discussion of selected aspects of African domestic and international politics. (Fall) McClintock
- 283 **Governments and Politics of Latin America** (3)  
Readings and discussion on the politics of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall) McClintock
- 284 **International Relations of Latin America** (3)  
Readings and discussion on U.S.-Latin American relations and the foreign policies of selected states. (Spring) Staff
- 286 **Selected Topics in American Politics** (3)  
Readings and discussion. (Fall or spring) Staff
- 287 **Selected Topics in Political Theory** (3)  
Readings and discussion. (Fall or spring) Staff
- 288 **Selected Topics in Comparative Politics** (3)  
Readings and discussion. (Fall or spring)



- 289 **Selected Topics in International Politics** (3) Staff  
Readings and discussion. (Fall or spring)
- 297 **Reading** (3) Staff  
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)
- 298 **Research** (3) Staff  
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff
- 301 **Advanced Reading and Research in Political Theory** (3) Staff
- 310 **Advanced Reading and Research in American Politics** (3) Staff
- 340 **Advanced Reading and Research in Comparative Politics** (3) Staff
- 350 **Advanced Reading and Research in International Politics** (3) Staff
- 397 **Advanced Reading** (3) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 398 **Advanced Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## PORTUGUESE

See **Romance Languages and Literatures.**

## PSYCHOLOGY

Professors J.N. Mosél, R.D. Walk, A.D. Kirsch, V. Kirkbride (Emeritus), C.E. Rice, E. Abravanel, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron (Research), L.A. Rothblat, R.F. Caron (Research), R.A. Peterson, J. Zeidner (Research), H. Weingartner

Professorial Lecturers R.K. Kahn, M. Sashkin, J.C. Sharf

Associate Professors S.A. Karp, R.W. Holmstrom, P.J. Poppen (Chair), L. Brandt, S. Hashtroudi, L.R. Offermann

Associate Professorial Lecturer R.W. Swezey

Assistant Professors C.A. Rohrbeck, F.Z. Belgrave, M.L. Jasnoski

Adjunct Assistant Professor D.M. Cooper

Assistant Professorial Lecturer C.M. Carney

Lecturer P.J. Woodruff

### Clinical Training Staff

Clinical Professors J. Borriello, J.W. Cummings, D.E. Holmes, R.B. Kurz

Associate Clinical Professors E. Blum, D.A. Jensen, M.E. Zedek, E.J. Jordan

Assistant Clinical Professors H. Bruml, D.M. DePalma, C.S. Detchon, M. Harris, P.L. Ellman, M.D. Jasnow, M.J. Kearney, K.R. Miller, L.E. Moldauer, C.E. Parks, G.M. Royalty, W.L. Scarpetti

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—7 or 8 semester hours selected from Psyc 1, 5, and 6.
3. Required courses in related areas:
  - (a) 3 semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 3, 6, or 9. (Students expecting to do graduate study in psychology should elect Stat 53.)
  - (b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended),



political science or sociology, of which 6 hours must be from one of the following: anthropology, economics, history, political science, or sociology. If a student takes more than 6 hours in any one department, the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—Group A: Psyc 118, 121; Group B: Psyc 115, 144, 151, 156; Group C: Psyc 101, 129, 131; Group D: Psyc 110, 111, 112, 132.

It is recommended that students contact their academic advisors as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that many graduate schools require knowledge of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill the general requirements stated under Regulations, take an honors seminar (Psyc 197) or a 200-level seminar, and complete an independent study project (Psyc 191) with distinction. The grade point average in psychology required for graduation with Special Honors is 3.3.

*Bachelor of Arts/Master of Arts in the field of art therapy*—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

*Minor in psychology*—18 semester hours are required, including Psyc 1 and at least 9 semester hours of second-group psychology courses. Students considering graduate study in psychology are advised to take Psyc 5 or 6, a distribution of courses from categories A, B, C, D above, Psyc 196, and an elementary course in statistics.

*Master of Arts in the field of psychology*—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses, including Psyc 201 or 202 and 203 or 204; 6 semester hours may be in related fields approved by the department. For detailed requirements consult the chair of the doctoral program committee.

*Doctor of Philosophy in the field of psychology*—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Subject Test of the Graduate Record Examination are required for admission.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Psyc 201–2, 203–4, and appropriate statistics courses; and (2) the satisfactory completion of a first-year examination and the general test in the major area of study. For detailed requirements, consult the chair of the department or the chair of the doctoral program committee.

Areas of study: clinical, developmental, experimental, industrial and organizational, and applied social psychology.

**Departmental prerequisite:** Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of the instructor, students may elect Psyc 5–6 in the freshman year.

#### First Group

##### 1 General Psychology (3)

Fundamental principles underlying human behavior.

##### 5–6 Principles and Methods of Psychology (4–4)

Lecture (3 hours), laboratory (3 hours). An experimental approach to understand-

Staff  
(Fall and spring)  
Walk, Hashtroudi



- ing behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, \$10 per semester. (Academic year)
- 8 **Psychology of Motivation and Personality** (3) Staff  
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)
- 22 **Introduction to Educational Psychology** (3) Kirkbride  
The contributions of psychology to education; emphasis on learning. Includes fieldwork. (Spring)

### Second Group

- 101 **Abnormal Psychology** (3) Silber, Holmstrom, Weingartner  
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)
- 104 **Ecology and Mental Health** (3) Karp  
Examination by field research of the linkages between aspects of the physical environment and mental health. Tutorials, conferences, and student field research projects. (Fall)
- 108 **Humanistic Psychology** (3) Mosél  
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential, phenomenological, and transpersonal psychology. (Spring)
- 110 **Perception and Understanding in Children** (3) Abravanel  
Concepts and research in the area of developmental psychology; emphasis on the growth and development of thinking, perceiving, and symbolic activity. (Spring)
- 111 **Psychology of Childhood** (3) Brandt, Rohrbeck  
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.
- 112 **Psychology of Adolescence** (3) Staff  
Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems. (Fall or spring)
- 115 **Psychology of Language and Communication** (3) Mosél  
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in perception and neuro-linguistics programming. (Fall)
- 118 **Neuropsychology** (3) Rothblat  
Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)
- 119 **Group Dynamics** (3) Miller  
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited. (Spring)
- 121 **Psychology of Learning** (3) Hashtroudi  
Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)
- 122 **Psychology and Human Relations** (3) Silber  
Understanding human relations and T-group techniques by evolving an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)



- 129 **Theories of Personality** (3) Poppen, Rice, Jasnoski  
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring) Karp
- 130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3)  
Presentation and discussion of recent work, such as that of Szasz and Goffman, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification. Holmstrom, Karp
- 131 **Psychological Tests** (3)  
Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, \$10. (Fall and spring) Brandt
- 132 **Socialization in Childhood** (3)  
Examination of primary methods by which the child is shaped in terms of social judgment and self-control; internalization of controls, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level. Miller
- 135 **Freud and Modern Psychoanalysis** (3)  
Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring) Offermann and Staff
- 144 **Industrial/Organizational Psychology** (3)  
Psychological concepts and methods applied to problems of personnel management, employee motivation and productivity, supervisory leadership, and organizational development. (Fall and spring) Poppen
- 150 **Psychology of Sex Differences** (3)  
Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing. Belgrave
- 151 **Social Psychology** (3)  
Social foundations of behavior: cognition, motivation, role behavior, communication, small-group processes, and attitudes. (Fall and spring) Silber
- 154 **Psychology of Crime and Violence** (3)  
Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Spring) Staff
- 156 **Psychology of Attitudes and Public Opinion** (3)  
Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare. Peterson
- 170 **Clinical Psychology** (3)  
An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psych 101, 131. Staff
- 188 **Attitudes Toward Death and Dying** (3)  
Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors. Staff
- 191 **Independent Research in Psychology** (3)  
Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring) Abravanel
- 192 **Field Experience in Psychology** (3)  
Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have blocks of time available in their class schedules. (Fall and spring)



- 196 **History and Systems of Psychology** (3) Rice, Walk  
Senior capstone course that includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)
- 197 **Honors Seminar in Psychology** (3) Staff  
Selected topics in psychology that change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 in the senior year and for students in the Special Honors program in psychology. May be repeated for credit.
- 198 **Current Research Issues in Psychology** (3) Staff  
Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

### Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

- 201-2 **Psychological Research Methods and Procedures** (3-3) Abravanel, Holmstrom, and Staff  
Required in all graduate psychology programs. Includes philosophy of science, types of research design, and methods of data collection. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics. (Academic year)
- 203-4 **Experimental Foundations of Psychology** (3-3) Hashtroudi, Rothblat, and Staff  
Required of doctoral students in psychology during first year of study. Psyc 203: Basic issues in learning and memory. Psyc 204: Physiological processes; sensation and perception. (Academic year)
- 207-8 **Psychological Assessment** (3-3) Holmstrom, Silber  
Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, \$10 per semester. (Academic year)
- 209 **Seminar: Psychology of Motivation** (3) Staff  
Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)
- 211 **Assessment of Cognitive Functioning** (3) Staff  
Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, \$20. Admission by permission of instructor. (Summer)
- 212 **Personality Assessment by Projective Techniques** (3) Staff  
Methods of personality assessment, primarily the Rorschach. Material fee, \$15. Admission by permission of instructor. (Summer)
- 213-14 **Seminar: Developmental Psychology** (3-3) Abravanel, Brandt  
Psyc 213: research and theory in developmental psychology, with emphasis on cognitive, perceptual, and language functioning development. Psyc 214: current research and theoretical issues in cognitive and social development in infancy and the social bases of communication and language. (Academic year)
- 215 **Psychodynamic Approaches to Child Assessment and Therapy** (3) Miller  
A broad range of issues in child personality development will be considered, with special focus on drives, interpersonal relations, defenses, intellectual capacities, and moral development. Admission by permission of instructor. Material fee, \$10. (Fall)
- 216 **Psychological Assessment by Graphic Means** (3) Staff  
Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)



- 218 **Seminar: Systems of Psychotherapy** (3) Jasnoski, Silber  
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego centered, nondirective, transactional, and others. Original sources surveyed. (Fall and summer)
- 219 **Group Dynamics** (3) Miller  
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited.
- 220 **Seminar: Abnormal Psychology** (3) Miller  
Study of selected problems of psychopathology. (Fall)
- 221-22 **Seminar: Group Psychotherapy** (3-3) Borriello  
For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: Survey of group therapy approaches; Psyc 222: Supervised experience with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Alternate academic years)
- 223 **Seminar: Human Memory** (3) Hashtroudi  
Selected topics of current research interest in the area of human memory. Emphasis on encoding and retrieval processes, amnesia, and disorders of memory. (Spring)
- 225 **Behavioral Approaches to Child Assessment and Therapy** (3) Rohrbeck  
Child assessment and treatment from a behavioral viewpoint. The application of conditioning, reinforcement, and shaping principles with reference to specific disorders of childhood.
- 226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Branch  
For graduate students in psychology; open to others with permission of instructor. Exploration of major topics concerning psychopathology in children and adolescents; discussion of nosological issues with emphasis on theoretical and research literature.
- 227-28 **Seminar: Principles of Psychotherapy** (3-3) Kahn  
For graduate students in clinical psychology; open to others with permission of instructor, if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218. (Academic year)
- 229 **Seminar: Principles of Behavior Change** (3) Peterson  
Behavioral learning methods and theory applied to clinical problems. (Fall)
- 230 **Methods in Applied Behavior Analysis** (3) Staff  
Methodology used in clinical behavioral research and other areas, using a small number of subjects. Research designs and data collection techniques are emphasized. (Fall)
- 231 **Development of Psychometric Instruments** (3) Most  
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)
- 232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom  
Emphasis on theoretical contributions of Freud, Hartmann, Klein, Kernberg, Kohut, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders. (Spring)
- 234 **Seminar: Theory of Psychological Measurement** (3) Mosel  
Examination of classical test theory (which underlies most current test construction and interpretation) and the newly emerging area of item-response theory. Recent developments in validity generalization. (Spring—alternate years)
- 235 **Seminar: Community Mental Health** (3) McNally  
For graduate students in the Department of Psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques



- in community mental health; emphasis on educational systems and community mental health issues.
- 236 **Seminar: Minorities and Mental Health** (3) McNally  
Factors affecting the mental health of minorities. Treatment considerations and differences in theoretical approaches with respect to minorities. (Spring)
- 237-38 **The Practice of General Psychology** (3-3) Staff  
Application of psychological principles and findings to a wide spectrum of human problems. Professional issues facing the psychologist offering services. Participation in the development, implementation, and evaluation of applied psychological services and projects. (Academic year)
- 240 **Seminar: Selected Topics in Psychopathology** (3) Silber  
Examination of current research and theory in psychopathology. (Spring)
- 241-42 **Family Systems: Theory, Practice, and Research** (3-3) Staff  
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year)
- 243 **Psychoanalytic Theory and Research** (3) Miller  
An introduction to classical and modern psychoanalytic theory and research. A review of Freud's central works, focusing on his case studies and their role in theory development. Emphasis on instinct theory, with comparisons to contemporary studies of dreams, infant observation, male and female personality development, psychopathology, and related topics.
- 244 **Theories and Processes of Organizational Management** (3) Staff  
Basic functions and techniques of organizational management—design, control, direction, and decision making—examined from the viewpoint of behavioral science.
- 245 **Seminar: Organizational Behavior** (3) Mosél  
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)
- 246 **Seminar: Personnel Evaluation Techniques** (3) Sharf  
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.
- 247 **Seminar: Psychology of Leadership in Organizations** (3) Offermann  
Theories and issues related to the emergence and effectiveness of leaders, with focus on leadership behaviors and processes in organizations.
- 248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Staff  
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Fall)
- 249 **Organizational Behavior Modification** (3) Mosél  
Application of operant reinforcement, behavioral systems analysis, and other experimentally derived procedures, such as goal setting and feedback, to improving individual and group work performance. New approaches to intrinsic job motivation based on covert reinforcement principles. (Spring—alternate years)
- 250 **Human Resources Management** (3) Staff  
An examination within a psychological systems perspective of the requirements for integrating employee assessment, placement, training, and motivation modules into a unified human resources development program. Emphasis on models and techniques of organizational development and the utilization of key organizational factors to determine content of the program.
- 253-54 **Social Psychological Theories and Applications** (3-3) Offermann  
Social psychology theories, conceptual approaches, and their applications. Psych



- 253: Focus on attitude formation and change and on social-cognition, person perception, attribution, information processing, attraction, stereotyping. *Poppen*
- 254: Analysis of intentional and unintentional social influence processes and their effects on behavior. Current research on conformity, social power, social exchange, and impression management. (Academic year)
- 255 **Applied Research Methods: Research Design** (3) *Poppen*  
Analysis of problems in research design in basic and applied social psychological research. Focus on conceptualization, operationalization of variables, and experimental and quasi-experimental design. (Fall)
- 256 **Applied Research Methods: Data Collection and Analysis** (3) *Poppen*  
Methods of data collection and analysis, especially in field settings and surveys with nonexperimental designs. Topics include methods of obtaining information (questionnaires, interviews, records); creation of indicators; exploratory analysis of large-scale data bases; analysis and interpretation of data when research units have not been randomly assigned to treatments. (Spring)
- 257 **Current Topics in Social Psychology** (3) *Poppen, Offermann*  
Advanced seminar with focus on major theoretical approaches, research, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)
- 260 **Psychology of Work Group Development** (3) *Offermann*  
Examination of theory and research on groups as task performance systems. Approaches to team development as a means of improving work group effectiveness, including goal setting, role clarification, increasing interpersonal skills, and conflict resolution. (Spring)
- 263 **Evaluation Research** (3) *Rice*  
Research issues and methods in evaluating the impact of organizational and social intervention and service programs. Specification of program goals and effectiveness criteria; measurement problems; experimental and quasi-experimental designs; political problems surrounding evaluation research. (Spring, even years)
- 268 **Seminar: Neuropsychology** (3) *Rothblat*  
Selected problems in research relating the brain and behavior. Independent topics each semester, such as sensory processing, brain development and behavior, clinical aspects of nervous system function.
- 272 **Seminar: Theories of Personality** (3) *Staff*  
Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)
- 281 **Clinical Neuropsychology I** (3) *Rothblat*  
Analysis of experimental and clinical findings from studies attempting to localize and interpret human brain dysfunction, with emphasis on perceptual and cognitive behavior. Topics include overviews of neuroanatomy and neurological techniques, clinical description and theoretical consideration of major neuropsychological disorders, mechanisms underlying recovery of function and potential for rehabilitation. Graduate students in fields other than psychology admitted by permission of the instructor.
- 282 **Clinical Neuropsychology II** (3) *Staff*  
Examination of important psychological procedures for the assessment of human brain dysfunction. Instruments and batteries such as the Bender-Gestalt, Wechsler Adult Intelligence Scale, Halstead-Reitan Neuropsychological Battery, and Luria's Neuropsychological Tests. Prerequisite: Psyc 211, 212, 281, and permission of the instructor.
- 289 **Seminar: Current Topics in Experimental Psychology** (3) *Staff*  
Review and discussion of contemporary research and theory in a specialized field of psychological study, by leaders in the field. Independent topics each semester may be repeated for credit. (Fall and spring)
- 290 **Seminar: Macro-organizational Behavior** (3) *Rice*  
Examination of variables characterizing the total organization as the unit of analysis; the relationship of such variables to the behavior of the individual.



Complexity, power, and conflict will be considered, along with contextual dimensions such as organizational environment. (Fall, odd years)

291 **Theories of Organizational Behavior** (3) Staff

Examination of current theoretical models and research. (Spring)

292 **Seminar: Perception** (3) Walk

Study of current research and theory in the experimental psychology of perception and perceptual development. (Spring)

295 **Independent Research in Psychology** (3) Staff

Individual library or experimental research under supervision of staff member.

Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299-300 **Thesis Research** (3-3) Staff

(Fall and spring)

#### Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

#### PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown (*Emeritus*), W. Sommers (*Emeritus*), S.R. Chitwood, M.M. Harmon, S.J. Tolchin, W.C. Adams, B.L. Catron, M.E. Keane (*Distinguished Visiting*), C.F. Bingman (*Visiting*), C.W. Washington, S.J. Trachtenberg, G.H. Honadle (*Visiting*), K.E. Newcomer (*Chair*)

Professorial Lecturers H.M. West III, B.T. Pitsvada

Associate Professors J.F. Kasle, J.E. Kee, C.J. McSwain

See the School of Government and Business Administration for programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Philosophy.

#### Second Group

125 **Managing Public Policy** (3) Newcomer, Kasle, Kee

Contemporary concepts and issues in public administration and management. Major trends and approaches to governmental administration in the U.S., including the changing federal role, roles of the public sector in relation to the private sector, and managing public agencies at all levels. (Fall and spring)

#### Third Group

205 **Introduction to Public Administration and Management** (3)

Chitwood, McSwain

Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

208 **Ethics and Public Values** (3)

Catron

Ethical dimensions of personal and professional judgments of public officials. Cases are used to consider the ethos of public organizations and the moral foundations of public policy. (Fall)

212 **Legislative Management** (3)

Tolchin, Kasle

Analysis of Congress as a management system; examination of its internal administration and its role in formulating policy through legislation. Executive-legislative relationships, staffing practices, budget processes, leadership, rules and



- procedures, oversight functions, and the management of foreign policy are examined. (Fall) Tolchin
- 213 **Administration in the Federal Government** (3)  
Critical analysis of the structure and administration of the federal government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (Fall) Chitwood, Kasle
- 215 **Law and the Public Administrator** (3)  
Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring) Tolchin
- 216 **Federal Government Regulation of Society** (3)  
Analysis of the federal regulatory process as it affects the public and private sectors. Specific problems involving presidential management, policy conflicts, reform efforts, legislative oversight, and economic deregulation are emphasized. Same as BAd 203. (Spring) Honadle
- 217 **Seminar: Development Administration I** (3)  
The nature of program development and implementation. Specific organization and management problems of less developed countries. National, cultural, and political context. The giving of assistance: types of technical aid; problems of working with aid givers; analytical methods. (Fall) Honadle
- 218 **Seminar: Development Administration II** (3)  
The transfer of administrative capability from one country to another. Political and administrative development theories. The role of innovation. Strategies of institutional development. Organization of natural resource management. (Spring) Harmon
- 221 **Organization Theory and the Public Sector** (3)  
Analysis of organization theory with special focus on public organizations: current issues in organization theory; decision making; the organizational environment and the changing nature of organizations in a postindustrial society. (Fall and spring) McSwain
- 223 **Management Factors in Complex Organizations** (3)  
Analysis of the nature and characteristics of management and behavior in public organizations. Approaches to management and leadership, particularly in public organizations; influence and control systems; future trends. (Fall and spring) Chitwood, Kee
- 224 **Managerial Leadership in Complex Organizations** (3)  
What the manager must know and do to provide leadership and guidance in large, complex organizations. An exploration of factors and processes that condition effective executive and managerial leadership. (Spring) Staff
- 231 **Human Resources Management** (3)  
Same as BAd 210. McSwain
- 232 **The Human Resources Manager** (3)  
Same as BAd 212. West
- 233 **Seminar: Manpower Planning, Development, and Utilization** (3)  
Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches to the analysis and administration of manpower programs. Analysis of impact of economic, political, and social factors on manpower. (Fall) Frame
- 235 **Seminar: Technology Change and Professional Human Resource Planning** (3)  
Addresses human resource problems arising from automation and other technological changes. Evaluation of these developments in government, business, and educational organizations, and their implications for productivity, employment, training, and education. Analysis of economic, political, and social factors influencing public and private human resource policies. (Spring)



- 236 **Unionism and Collective Bargaining** (3) Burdetsky  
Same as BAd 217. (Fall)
- 242 **Administration of State and Local Governments** (3)  
Examination of state and local governmental structures and functions, their place within the federal system, their revenue sources, their limitations, and the alternatives available to encourage more effective administration to meet public and private demands. (Fall)
- 245 **Intergovernmental Relations** (3) Kee  
Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles, and responsibilities of federal, state, regional, and local systems are examined from both theoretical and practical vantage points.
- 246 **Dynamics of Citizen Participation in Administration** (3) McSwain  
Review of the basic theory and principles of democracy in the American system of governance. Analysis of the nature of participation in a pluralistic society, including the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which citizens may contribute to administration. (Fall)
- 248 **Financing State and Local Government** (3) Kee  
Analysis of the theory and practice of public finance in state and local governments. Includes the financing of services through municipal taxation, intergovernmental funds, debt instruments, and other revenue sources. Review of expenditures as well as financial management practices. (Fall)
- 249 **Urban Public Policy** (3) Staff  
Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring)
- 251 **Governmental Budgeting** (3) Pitsvada  
Survey of the basic concepts, principles, and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall)
- 252 **Public Expenditure Analysis and Planning** (3) Kee  
Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementation of public programs. Topics include benefit-cost analysis, program budgeting, and tax and expenditure analysis. (Fall and spring)
- 253 **Financial Management in the Public Sector** (3) Pitsvada  
Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies, focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing. (Spring)
- 260 **Policy Formulation and Administration** (3) Tolchin, Bingman  
Impact of economic and political factors on public policy formulation and implementation; intensive analysis of the analytical, normative, and decision-making models of the policy process with special emphasis on their relationship to current policy problems. (Fall and spring)
- 261 **Policy Analysis in Public Administration** (3) Catron, Newcomer  
Current issues in public policy analysis. Conceptual problems encountered in policy analysis. The role and limits of analytic techniques in the development, implementation, and evaluation of public policy. (Fall and spring)
- 264 **Public Program Evaluation** (3) Newcomer  
Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation, considering economic, political, social, and administrative factors. Examination of methodological considerations for design, data collection, analysis, and dissemination. (Spring)



- 267 **Cases in Public Policy** (3) Catron  
Critical analysis of topical issues in public policy, using a case-study approach. Specific issues covered will vary. Designed principally for M.P.A. students in the last half of their program. (Summer)
- 270 **Telecommunication Administration** (3) Kastle  
Human factors in telecommunication innovations within a public organization. Federal role in research, development, and regulation of telecommunications. Acquisitions process for major systems in federal agencies. International telecommunication policies and controversies. (Fall and spring)
- 271 **Telecommunications Management** (3) Kastle  
Emphasis on planning in regulated industries, managing in a technology-based industry, and personnel development. Varieties of management styles and their strengths and weaknesses; legal constraints; responsibilities and ethics. (Fall and spring)
- 272 **Telecommunications Finance** (3) Staff  
Theories and approaches to telecommunications economics and finance. Examination of cost and price setting, cost allocation, price de-averaging in response to competition, tariffs, accounting and jurisdictional separations, predatory pricing, and aggregate valuation and operating measures. (Spring)
- 274 **Regulation of Communications Common Carriers** (3) Kastle  
The history, development, law, and public policy issues of communications common carriers; emphasis on telephone and satellite industries; the impact of antitrust law; the effects of divestiture; the reconfiguration of the telephone industry; future trends. (Fall and spring)
- 275 **Telecommunications Choices for Public Managers** (3) Kastle  
Critical management and policy issues facing the public manager in telecommunications. Location of managerial responsibility, planning methods and needs surveys, centralized vs. decentralized management and control, in-house facilities vs. cost/time sharing, controlling costs, productivity implications, and networking. (Spring)
- 280 **Purchasing and Materials Management** (3) Sherman  
Same as BAd 280.
- 281 **Procurement and Contracting** (3) Sherman  
Same as BAd 281.
- 282 **Government Contract Administration** (3) Sherman  
Same as BAd 282.
- 283 **Pricing and Negotiation** (3) Sherman  
Same as BAd 283.
- 285 **Systems Procurement and Project Management** (3) Staff  
Same as BAd 285.
- 288 **Field Problem Studies in Public Administration** (3)  
Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public institutions. Open to master's students upon completion of 9 hours toward the degree program and with the consent of the intern coordinator. (Fall and spring)
- 289 **Public Program Management and Policy Implementation** (3) McSwain  
Review of the diverse concepts and issues in public administration; analysis and integration of political, economic, managerial, and leadership values and issues that are likely to be raised in implementing public policies in the future. Open only to M.P.A. degree candidates in their final semester of study; serves as a capstone seminar to the M.P.A. program. (Fall and spring)
- 290 **Special Topics in Public Administration** (3) Staff  
Experimental course; new course topics and teaching methods. May be repeated once for credit.
- 295 **Research Methods** (3) Adams, Newcomer  
Theory and practice in research methodology. Data sources and gathering, research models and designs. Critical evaluation of research studies. Emphasis on application of research methods to policy questions. (Fall and spring)



- 296 **Statistical Applications in Public Administration** (3) Adams, Newcomer  
Use of statistics, computers, and SPSS in research and program evaluations. Emphasis on interpretation and use of statistics. Development of basic statistical competency; frequency distribution, sampling, central tendency, variability, correlation, probability, regression. (Fall and spring)
- 298 **Directed Readings and Research in Public Administration** (3) Staff  
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.
- 299 **Thesis Seminar** (3) Staff  
Examination of thesis standards, research philosophy, and methodology in public administration.
- 300 **Thesis Research** (3) Staff

#### Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

- 311 **Seminar: Public-Private Sector Institutions and Relationships** (3) Tolchin  
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.
- 323 **Seminar: The Complex Organization** (3) McSwain  
Unique problems of complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.
- 373 **Seminar: Public Administration and American Political and Social Institutions** (3) McSwain  
Supervised in-depth study of contemporary and historical literature in selected fields in public administration. (Spring)
- 374 **Seminar: Trends in Public Administration Theory** (3) Harmon  
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behaviorism, humanism, existentialism, and phenomenology. (Fall)
- 377 **Seminar: Social Action and Public Policy** (3) Catron  
Interdisciplinary approach to the normative foundations of public policy. Focus on theoretical problems of social action; interrelation of theory and practice. (Spring)
- 393 **Substance and Method: Current Topics and Research in Public Administration** (1) Staff  
Current research discussed in a colloquium setting. The conduct of research and presentation of research findings. May be repeated for credit.
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to doctoral candidates preparing for the general examination. May be repeated for credit.
- 399 **Dissertation Research** (arr.) Staff  
Limited to doctoral candidates. May be repeated for credit.

#### PUBLIC POLICY—GRADUATE PROGRAMS

##### Doctoral Committee on Public Policy

A.V. Adams (Chair), E. Berkowitz, W.B. Griffith, C.J. Lange, P. Langton, W.H. Lewis, C.E. Rice, R.W. Rycroft, C.T. Stewart

The Graduate School of Arts and Sciences offers interdisciplinary programs leading to the degrees of Master of Arts and Doctor of Philosophy in the field of public policy. The master's program allows students to concentrate in one of four policy areas: environmental



and resource policy, gerontology, philosophy and social policy, or women's studies. The doctoral program, intended for those wishing to pursue academic or policymaking careers, is concerned with policy research and analysis; students may select an applied field of study in education policy, employment policy, health policy, natural resources and environmental policy, national security policy, and science and technology policy.

*Master of Arts in the field of public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences. For specific concentration requirements, consult the Graduate School office.

*Doctor of Philosophy in the field of public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) a pre-qualifying core curriculum consisting of Econ 211-12, 221-22; PAd 221; PSc 203; and one course chosen from PSc 216, 217, or 218; (2) a written qualifying examination; (3) a post-qualifying core consisting of Phil 255, Soc 776, and PPol 201; (4) a minimum of 18 hours related to one of the six policy fields; (5) completion of research skills requirements in two of the following: statistics, computer programming, and historical research methods; and (6) completion of the general examination in the form of a public policy paper.

**201 Seminar in Research Methods and Design (3)**

Research methods from an interdisciplinary social science perspective, including model construction, research design, measurement, sampling, data gathering (survey research, content analysis, and aggregate data), and secondary data. Prerequisite: an introductory social science research methods course. (Spring)

**398 Advanced Reading and Research (arr.)**

Limited to students preparing for the Doctor of Philosophy general examination.

**399 Dissertation Research (arr.)**

Limited to Doctor of Philosophy candidates. May be repeated for credit.

## RELIGION

University Professor S.H. Nasr

Professors R.G. Jones, H.E. Yeide, Jr. (Chair), D.D. Wallace, Jr., A.J. Hildebeitel

Associate Professorial Lecturer E.S. Jospe

Assistant Professor S.A. Quitslund

*Bachelor of Arts with a major in religion (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Rel 1, 2.
3. Four required courses in related areas—(a) 6 semester hours in studies of cultures other than American and English (preferably a foreign language), and (b) 6 semester hours in either literature, philosophy, or history.

4. Required courses in the major—30 semester hours, including at least 21 hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Christianity, Hinduism, Islam, and Judaism. Appropriate graduate seminars may be approved as substitutions for advanced-level courses. The program must include Rel 101 and at least one course each in Hebrew Scriptures and in New Testament.

Special Honors are awarded to students who meet the requirements stated under Regulations and who complete an honors thesis by enrolling in Rel 191.

It is recommended that students include the study of foreign languages in their undergraduate program, including a language crucial to one of the religious traditions. All students expecting to enter graduate school are urged to study French or German.

*Minor in religion*—Required: a minimum of 18 semester hours in religion, of which at least 6 must be upper-level courses. The minor program will be developed in consultation with the departmental advisor. Rel 101 is strongly recommended for all participating students.

*Doctor of Philosophy in the field of American religious history*—See History.



## First Group

- 1 **Introduction to World Religions: West** (3) Staff  
(Formerly Rel 2)

Examination of the religions of the ancient Mediterranean and the major religions of the West. Religious foundations of Western civilizations. The development of Judaism, Christianity, and Islam and their confrontations with secularization and political upheaval in the modern world. (Fall and spring)

- 2 **Introduction to World Religions: East** (3) Staff  
(Formerly Rel 1)

Examination of the major religions of the East and comparison with religions in the West. Approaches to the cross-cultural study of religion. Hinduism, Buddhism, and the religions of Tibet, China, and Japan are studied with respect to their history and their encounter with modernity. (Fall and spring)

- 9 **The Hebrew Scriptures** (3) Jones

The history, literature, and religious thought represented by the Hebrew Scriptures (Old Testament). Continuities and contrasts between Israel and the ancient Near East are considered through study of the world view, oral and literary tradition, main religious ideas, and chief figures and movements of the biblical literature. (Fall and spring)

- 10 **The New Testament** (3) Jones

Literature and history of earliest Christianity in the setting of the religious movements of the Greco-Roman world and developments within Judaism. The meaning of the earliest Christian proclamation about the significance of the life, teaching, and death of Jesus of Nazareth becomes the basis for tracing the formation and expansion of the Christian movement. Special attention to Jesus and Paul. Developments in worship, church structure, and the rise of early theological affirmation. (Fall and spring)

- 23 **Judaism: Identities and Ideas** (3) Staff

Exploration of important practices and beliefs in classical and modern times. Study of people and texts that confront tradition and change. This course presents several academic approaches to the description and definition of Judaic ways of life. Readings and discussions focus on the myths and rituals of Judaism. (Fall and spring)

## Second Group

- 101 **Theories in the Study of Religion** (3) Staff

Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

- 103 **The Prophets** (3) Quitslund

Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets. (Fall)

- 104 **The Life and Thought of Jesus** (3) Quitslund

Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus.

- 105 **The Life and Thought of Paul** (3) Quitslund

Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith. (Spring)

- 107 **Rabbinic Literature and Thought** (3) Staff

Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects.



- 111 **Myth, Epic, and Novel** (3)  
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett. *Hiltebeitel*  
Staff
- 113 **Early Post-Biblical Judaism** (3)  
History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings. *Staff*
- 114 **Judaism in the Rabbinic Period** (3)  
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature. *Staff*
- 115 **Judaism in the Medieval World** (3)  
History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects, and messianic movements. *Staff*
- 116 **Judaism After Emancipation** (3)  
Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel. *Staff*
- 121 **Ethics and the World Religions** (3)  
Modern concepts of ethics and their relation to major world religions; religion as stimulus and barrier to moral change; modern moral issues and religious ethics. *Yeide*
- 122 **Christian Ethics and Modern Society** (3)  
Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to various social institutions. *Yeide*
- 124 **Contemporary Movements in Theology** (3)  
Theological approach and systems of a selected number of modern theologians and/or theological movements such as process theology, liberation theology. *Quitslund*
- 126 **Western Mysticism** (3)  
Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam. (Spring) *Quitslund*
- 127 **Medicine, Religion, and Healing** (1)  
Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics. (Spring) *Yeide*
- 134 **The Holocaust in Film and Literature** (3)  
Study of artistic responses in fiction and nonfiction to a period of supreme importance in Jewish and world history; the attempts on screen and in print to confront and understand this modern catastrophe. *Staff*
- 143 **Early Christianity and the Spiritual Life of the Ancient World** (3)  
Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500. (Fall) *Wallace*
- 144 **Medieval Faith and Symbolism** (3)  
Christian life and thought in the Middle Ages; mystics, saints, popes, and philosophers. (Spring) *Wallace*
- 145 **Religious Currents in the Renaissance and Reformation** (3)  
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason. *Wallace*
- 146 **Christianity from the Enlightenment to Existentialism** (3)  
Changes in Christian life and thought since 1700, as seen in theology, literature, political life, and religious institutions. *Wallace*



- 155 **Anthropological Approaches to Religion** (3) Simons, Wagner  
Same as Anth 155.
- 157 **Indian Philosophy and Mysticism** (3) Hiltebeitel  
Indian speculative and mystical traditions; late Vedas, *Upanishads*, *Bhagavad Gita*, Buddhist, and Hindu soteriological systems.
- 158 **Hinduism** (3) Hiltebeitel  
Study of continuity and change in Hinduism, with emphasis on historical development and the consolidating features of the religion. Attention to relations between classical and popular living forms. (Fall)
- 159 **Mythologies of India** (3) Hiltebeitel  
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); ties with Indian art, caste, cult, cosmology, and spiritual ideals.
- 160 **Buddhism** (3) Hiltebeitel  
Origin, development, and contemporary status of Buddhist life and thought; its impact on Asia. (Spring)
- 161 **Islam** (3) Nasr  
Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East. (Fall)
- 162 **Symbolism in the History of Religions** (3) Hiltebeitel  
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses.
- 163 **Islamic Religion and Art** (3) Nasr  
Investigation of major forms of Islamic art, such as calligraphy, architecture, and urban design; Quranic chanting, poetry, and music in relation to the principles of Islamic revelation. Same as Art 119.
- 164 **Islamic Philosophy and Theology** (3) Nasr  
The major schools of Islamic philosophy and theology, considered in both a morphological and historical manner. The relation between revelation and reason, determination and free will, and divine and human knowledge as well as the relation among science, philosophy, and religion. The development of various schools of thought, from the classical period to the present. (Spring)
- 165 **Sufism (Islamic Mysticism)** (3) Nasr  
The foundation of Sufism in the Quranic revelation, its subsequent development, and its significance within Islamic civilization. Doctrines and practices of Sufism; history of the Sufi orders; Sufi literature, particularly in Arabic and Persian. The influence of Sufism upon social and political life and its state and role in the contemporary world, both Islamic and non-Islamic.
- 172 **Religion in American Culture** (3) Wallace  
Growth of religious groups and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Fall)
- 174 **American Judaism** (3) Staff  
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Spring)
- 181 **Women in Western Religion** (3) Quitslund  
Historical, theological, and ethical investigation of the image and role of women in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male and female images and languages, and contemporary issues. (Fall)
- 183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy  
Same as Engl/Fren/Ger/Hist 183 and Art 187.
- 184 **The Thought of Martin Buber** (3) Jospe  
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm.



**190 Selected Topics in Religion (3)**

Critical examination of religious phenomena rendered timely by current events or special resources. Topic announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Fall and spring)

**191 Senior Honors Thesis (3)**

Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

**Third Group****209-10 Seminar: Biblical Studies (3-3)**

Main problems of Biblical literary, historical, and theological criticism.

**213 Seminar: Judaism in Late Antiquity (3)**

Selected topics. (Fall)

**222 Seminar: Ethics (3)**

Selected topics. (Fall)

**235 Seminar: Roman Catholicism in the Modern World (3)**

Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on the 20th century.

**237 Seminar: Theological Analysis (3)**

Historical and topical study of the development of important ideas in such areas as Christology, ecclesiology, and death. (Fall)

**238 Seminar: Contemporary Judaism (3)**

Selected topics.

**260 Seminar: Topics in Islamic Studies (3)**

Study of sources and approaches to the investigation of Islam by both Western Islamicists and Muslim scholars, with discussion of the main controversial issues and differences in methods used by various schools of scholarship. Prerequisite: A course on Islam or permission of instructor.

**261 Seminar: Topics in Islamic Thought (3)**

Perennial major issues in Islamic theology, philosophy, and Sufism such as Divine Unity, prophetology, eschatology, religious knowledge, sacred law, and ethics. Prerequisite: A course on Islam or permission of instructor.

**262 Seminar: History of Eastern Religions (3)**

Selected topics. (Spring)

**271 Seminar: American Religious History to 1830 (3)**

Religious thought and life during the Colonial and early National period.

**273 Seminar: American Religious History Since 1830 (3)**

Religious thought and life from the Civil War to the present. (Spring)

**291-92 Readings and Research (3-3)**

Investigation of special problems. (Academic year)

**299-300 Thesis Research (3-3)**

(Fall and spring)

**ROMANCE LANGUAGES AND LITERATURES**

Professors J.A. Frey (Chair), J.F. Burks, I. Azar

Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett, J.M. Thibault

Assistant Professors G.P. Huvé, Y. Captain-Hidalgo, J.A. Quiroga, R. Valero

Adjunct Assistant Professors M. Ferretti, R. Verona, M.N. Ament, L. Franklin, D. Konz

Bachelor of Arts with a major in (1) French language and literature, (2) Spanish language and literature, (3) Spanish-American literature—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Fren/Span 1-2-3, 4, 8 or 9, 10, 30, or equivalent.
3. Required for the majors—Fren/Span 53, 54, and 90 plus 15 semester hours of second-group courses, of which 9 hours must be in literature. The student is expected to demon-



strate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar (Fren/Span 199-200) is required.

**Minor in French or Hispanic languages and literatures**—Required: 9 semester hours chosen from Fren or Span 30, 53, 54, 90; 12 additional hours selected from among French or Spanish courses numbered 8 and above, including at least 6 semester hours of second-group courses.

**Placement Examinations:** A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

## FRENCH

**Departmental prerequisite:** Fren 4 or equivalent is prerequisite to all courses in French, from Fren 8 and above.

- 1-2-3 **Introductory French (4-4-4)** Frey and Staff  
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, \$35 per semester. (Fall, spring, and summer)
- 4 **Language and Culture (3)** Verona and Staff  
A study of the history, geography, and culture of France, with emphasis on conversation and composition. Prerequisite: Fren 3 or equivalent. Laboratory fee, \$35. (Fall, spring, and summer)
- 8 **The Language of Business, Commerce, and Management (3)** Staff  
Refining of general linguistic competence; introduction to French economic life; the language of business and finance. Emphasis on oral presentation, stressing communicative skills. Prerequisite: Fren 4 or equivalent. (Fall)
- 9 **Contemporary Institutions (3)** Staff  
(Formerly Oral and Written French)  
Fifth-semester language study based on written and video documentation of contemporary society, institutions, everyday life, current events. Emphasis on oral presentation, stressing communicative skills. Material fee, \$35. Prerequisite: Fren 4. (Fall, spring, and summer)
- 10 **Press, Communication, and Politics (3)** Huvé and Staff  
(Formerly Oral and Written French)  
Sixth-semester language study utilizing daily and weekly newspapers and magazines. Emphasis on writing skills. Special attention to national and international issues as seen from the perspective of France and the Francophone world. Prerequisite: Fren 8 or 9. (Fall, spring, and summer)
- 20 **French Pronunciation (3)** Huvé  
(Formerly Fren 103)  
The sounds of French. Oral readings, presentations, recitation. Poetry, scenes from plays. Emphasis on phonetics and diction, with attention to accent, rhythm, and intonation. Prerequisite: Fren 10. (Fall)
- 30 **General Readings in French Literature (3)** Staff  
(Formerly Fren 91)  
Readings in prose, poetry, and drama. Introduction to techniques of textual criticism; attention to linguistic and stylistic difficulties in textual analysis. Prerequisite: Fren 10. (Fall and spring)
- 49 **French for Graduate Students (0)** Staff  
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of 3 credit hours. (Fall and summer)
- 53 **History of French Literature from the Middle Ages Through the 17th Century (3)** Burks, Coffland  
(Formerly Fren 51)  
Lecture and discussion in French. Development of genre and movements. Selected readings across these periods plus the reading of complete texts of epics, essays, novels, and plays. Prerequisite: Fren 30 or equivalent. (Fall)



**54 History of French Literature from the 18th Through the 20th Century (3)**

(Formerly Fren 52)

Lecture and discussion in French. Philosophical and literary movements of the modern period. Selected readings across the period plus the reading of complete texts of novels and drama. Prerequisite: Fren 30 or equivalent. (Spring)

Burks, Coffland

**90 Textual Analysis (3)**

(Formerly Fren 92)

Methodology and vocabulary of literary criticism. Application of various principles of textual analysis and critical approaches to literature. Prerequisite: Fren 30 or equivalent. (Spring)

Frey and Staff

**108 Advanced French Grammar and Style (3)**

Composition, drills, dictations. Translations into French. Study of vocabulary and syntax, with emphasis on stylistic devices. Prerequisite: Fren 10. (Spring)

Thibault and Staff

**109 Contemporary France (3)**

(Formerly Advanced Oral and Written French)

Emphasis on advanced oral work. Discussion of French culture and civilization. based on contemporary writings and video documents. Material fee, \$35. Prerequisite: Fren 10. (Fall)

Staff

**110 Business and Commercial French (3)**

(Formerly Advanced Oral and Written French)

Structure and language of French economic institutions. Discussion of legal, financial, and administrative documents. Oral and written reports. Preparation for the certificate of the Paris Chamber of Commerce. Prerequisite: Fren 10. (Spring)

Staff

**120 Studies in Medieval French Literature (3)**

(Formerly Fren 119)

Readings and analysis of the major literary texts from the 11th through 15th centuries. Chansons de geste, Courtly literature, fabliaux, drama, lyric and didactic poetry. (Spring)

Frey and Staff

**121 French Literature of the Renaissance (3)**

(Formerly Fren 120)

The development and maturation of humanistic ideals in France during the 16th century. Rabelais, Montaigne, and La Pléiade. (Spring)

Burks and Staff

**122 The Age of Classicism (3)**

Drama, philosophy, criticism, poetry, and fiction of the 17th century. Study of major social, political, and religious movements: préciosité, Baroque, Jansenism, rationalism. (Spring)

Burks, Ludlow

**123 The Age of Enlightenment (3)**

Study of major novelists, dramatists, philosophes, and ideologues of the 18th century. The influence of the works of Montesquieu, Voltaire, Diderot, and Rousseau on European and American thought of the period. (Spring)

Ludlow

**124 19th-Century French Literature (3)**

(Formerly Fren 125-26)

Study of the major literary movements of the 19th century from romanticism to symbolism. Emphasis on stylistic analysis of major poems, novels, and dramas. (Fall)

Coffland, Thibault

**125 Studies in 20th-Century French Literature (3)**

(Formerly Fren 127-28)

The major literary movements of the 20th century: avant-garde, surrealism, existentialism, nouveau roman, and nouveau théâtre. (Spring)

Staff

**130 Theory of Poetic Discourse (3)**

An examination of the creation and evolution of poetic genres. Textual analysis of major French poets. (Fall)

Staff

**131 Theory of Narrative Discourse (3)**

Study of the various traditions in the novel, from its medieval origins to the present. (Spring)



- 132 **Theory of Drama** (3) Staff  
Study of major dramatic genre. Medieval forms, classic tragedy and comedy; Romantic drama and melodrama; *fin de siècle*; contemporary theatre.
- 133-34 **Special Topics in French Literature** (3-3) Staff  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Academic year)
- 199-200 **Proseminar** (3-3) Staff  
Required of all majors; preparation for the major field examination. Conferences, group discussion, practicum; literature in relation to the other arts and the social sciences. Fren 199: textual analysis, literary criticism, theory, and methods. Fren 200: the concepts of literary history and the history of French literature; periods, authors, genres, topics. (Academic year)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

## ITALIAN

- 1-2-3 **Introductory Italian** (4-4-4) Coffland and Staff  
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, \$35 per semester. (Ital 1 and 3—fall; Ital 2—spring)
- 4 **Language and Culture** (3) Coffland and Staff  
A study of the history, geography, and culture of Italy, with emphasis on conversation and composition. Prerequisite: Ital 3 or equivalent. Laboratory fee, \$35 per semester. (Spring)
- 9 **Contemporary Institutions** (3) Ferretti  
(Formerly Oral and Written Italian)  
Fifth semester language study based on written and video documentation of contemporary society, institutions, everyday life, current events. Emphasis on oral presentation, stressing communicative skills. Material fee: \$35. Prerequisite: Ital 4.
- 10 **Press, Communication, and Politics** (3) Ferretti  
(Formerly Oral and Written Italian)  
Sixth semester language utilizing daily and weekly newspapers and magazines. Emphasis on writing skills. Special attention to national and international issues as seen from the perspective of Italy. Prerequisite: Ital 9.
- 51-52 **Survey of Italian Literature** (3-3) Ferretti  
Readings in Italian literature from the Middle Ages to the present. Lectures, reports, and informal discussions. (Academic year)

## PORTUGUESE

- 1-2-3 **Introductory Portuguese** (4-4-4) Franklin  
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, \$35 per semester. (Port 1 and 3—fall; Port 2—spring)
- 4 **Language and Culture** (3) Franklin  
A study of the history, geography, and culture of Brazil, with emphasis on conversation and composition. Prerequisite: Port 3 or equivalent. Laboratory fee, \$35. (Spring)
- 9 **Contemporary Institutions** (3) Franklin  
(Formerly Oral and Written Portuguese)  
Fifth semester language study based on written and video documentation of contemporary society, institutions, everyday life, current events. Emphasis on oral presentation, stressing communicative skills. Material fee: \$35. Prerequisite: Port 4. (Offered as the demand warrants)
- 10 **Press, Communication, and Politics** (3) Franklin  
(Formerly Oral and Written Portuguese)  
Sixth semester language utilizing daily and weekly newspapers and magazines.



Emphasis on writing skills. Special attention to national and international issues as seen from the perspective of Brazil and Portugal. Prerequisite: Port 9. (Offered as the demand warrants)

## ROMANIAN

### 49-50 Readings in Romanian (3-3)

An introductory course that stresses the basic grammar of Romanian and concentrates on the development of reading skills. Knowledge of another Romance language is useful. (Offered as the demand warrants)

## SPANISH

**Departmental prerequisite:** Span 4 or equivalent is prerequisite to all courses in Spanish, from Span 8 and above.

### 1-2-3 Introductory Spanish (4-4-4)

A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, \$35 per semester. (Fall, spring, and summer)

### 4 Language and Culture (3)

A study of the history, geography, and culture of Spain, with emphasis on conversation and composition. Prerequisite: Span 3 or equivalent. Laboratory fee, \$35. (Fall, spring, and summer)

### 8 The Language of Business, Commerce, and Management (3)

Refining of general linguistic competence; introduction to the economic life of Latin America and Spain; the language of business and finance. Emphasis on oral presentation, stressing communicative skills. Prerequisite: Span 4 or equivalent. (Fall)

### 9 Contemporary Institutions (3)

(Formerly Oral and Written Spanish)  
Fifth-semester language study based on written and video documentation of contemporary society, institutions, everyday life, current events. Emphasis on oral presentation, stressing communicative skills. Material fee: \$35. Prerequisite: Span 4. (Fall, spring, and summer)

### 10 Press, Communication, and Politics (3)

(Formerly Oral and Written Spanish)  
Sixth-semester language study utilizing daily and weekly newspapers and magazines. Emphasis on writing skills. Special attention to national and international issues as seen from the perspective of Spain and Spanish America. Prerequisite: Span 8 or 9. (Fall, spring, and summer)

### 20 Spanish Pronunciation (3)

(Formerly Span 103)  
The sounds of Spanish. Oral readings, presentations, recitation. Poetry, scenes from plays. Emphasis on phonetics and diction, with attention to accent, rhythm, and intonation. Prerequisite: Span 10. (Fall)

### 30 General Readings in Spanish Literature (3)

(Formerly Span 91)  
Readings in prose, poetry, and drama. Introduction to techniques of textual criticism; attention to linguistic and stylistic difficulties in textual analysis. Prerequisite: Span 10. (Fall and spring)

### 49 Spanish for Graduate Students (0)

For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of 3 credit hours. (Fall)

### 53 History of Spanish Literature from the Middle Ages

Through the Siglo de Oro (3)  
(Formerly Span 51)  
Lecture and discussion in Spanish. Development of genre and movements. Selected readings across the period plus the reading of complete texts of epics, essays, novels, and drama. Prerequisite: Span 30 or equivalent. (Fall)



- 54 **History of Spanish Literature from the 18th Through the 20th Century** (3) Sáenz, Captain-Hidalgo  
(Formerly Span 52)  
Lecture and discussion in Spanish. Philosophical and literary movements of the modern period. Selected readings across the period plus the reading of complete texts of novels and drama. Prerequisite: Span 30 or equivalent. (Spring)
- 90 **Textual Analysis** (3) Azar and Staff  
(Formerly Span 92)  
Methodology and vocabulary of literary criticism. Application of various principles of textual analysis and critical approaches to literature. Prerequisite: Span 30 or equivalent. (Spring)
- 108 **Advanced Spanish Grammar and Style** (3) Quiroga, Valero  
Composition, drills, dictations. Translations into Spanish. Study of vocabulary and syntax, with emphasis on stylistic devices. Prerequisite: Span 10. (Spring)
- 109 **Contemporary Spain and Latin America** (3) Staff  
(Formerly Modern Spanish Syntax)  
Emphasis on advanced oral work. Discussion of Hispanic culture and civilization, based on contemporary writings and video documents. Material fee, \$35. Prerequisite: Span 10. (Fall)
- 110 **Business and Commercial Spanish** (3) Staff  
(Formerly Modern Spanish Syntax)  
Structure and language of Latin American and Spanish economic institutions. Discussion of legal, financial, and administrative documents. Oral and written reports. Prerequisite: Span 10. (Spring)
- 120 **Studies in Medieval Spanish Literature** (3) Azar  
Reading and analysis of the major literary texts from the 11th through the 15th century. Attention paid to linguistic aspects of Old Spanish. (Fall)
- 121 **Studies in Golden Age Literature** (3) Azar  
Reading and analysis of the major texts of the 16th and 17th centuries. Lyric poetry and the "invention" of subjectivity. Prose fiction and the structure of life. Golden Age Comedia and the relation between private and public life. Humanism and the Classical Tradition. The invention of the press, the status of writing, and the new culture of the book. The (post)modernity of Golden Age literature. (Formerly Span 123-24)
- 122-23 **Cervantes' Don Quijote and the Rise of the Novel** (3) Azar  
(Formerly Span 123-24)  
The novel as a genre. Literature as an institution: Western literary tradition constructed and deconstructed. The structure of narrative and the question of truth. Literature and life.
- 124 **18th and 19th Century Spanish Literature** (3) Staff  
(Formerly Span 125-26)  
Readings in major 18th and 19th century texts. Romanticism, *Costumbrismo*, realism, naturalism.
- 125 **Contemporary Spanish Literature** (3) Sáenz  
(Formerly Span 127-28)  
Prose, poetry, and drama of the 20th century; Generations of 1898, of 1927, the novel after the Spanish Civil War. (Spring)
- 130 **Theory of Poetic Discourse** (3) Staff  
Major classical and modern poetic traditions and genres. Textual analysis of major Spanish works.
- 131 **Theory of Narrative Discourse** (3) Staff  
Emphasis on the novel and short story. (Fall)
- 132 **Theory of Drama** (3) Azar, Valero  
Study of major dramatic traditions in Spain. Emphasis on the *commedia*.
- 133-34 **Special Topics in Spanish Literature** (3-3) Staff  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Academic year)



- 151-52 **The Spanish-American Novel** (3-3)  
Development of the novel in Spanish America. Lectures, collateral readings, and class analysis of texts. Staff
- 155-56 **Spanish-American Literature to 1880** (3-3)  
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral readings, reports, and class analysis of important works. (Academic year) Staff
- 157-58 **Spanish-American Literature Since 1880** (3-3)  
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral readings, reports, and class analysis of important works. Staff
- 199-200 **Proseminar** (3-3)  
Required of all majors; preparation for the major field examination. Conferences, group discussion, practicum; literature in relation to the other arts and the social sciences. Span 199: textual analysis, literary criticism, theory, and methods. Span 200: the concepts of literary history and the history of Spanish literature, periods, authors, genres, topics. (Academic year) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)

#### ROMANCE LITERATURES

- 270 **Seminar: Literary History** (3)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff
- 271 **Seminar: Literary Criticism** (3)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff
- 272 **Seminar: Literary Theory** (3)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff
- 273 **Seminar: History of the Language/Linguistics** (3)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301-14. Students wishing to register for these courses should consult the chairman of the Department of Romance Languages and Literatures.

- 301-14 **Folger Institute Seminars** (3 each)  
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. and spring) Staff

#### RUSSIAN AND EAST EUROPEAN STUDIES—GRADUATE PROGRAM

**Program Committee:** S.L. Wolchik (Director), H. Agnew, M.A. Atkin, C.F. Elliott, C.A. Linden, C.A. Moser, Y. Olkhovsky, J. Pelzman, P. Reddaway, M.J. Sodaro, R. Thornton

**Master of Arts in the field of Russian and East European studies**—Offered by the Elliott School of International Affairs, this multidisciplinary program gives students a broad grasp of the history, politics, economics, culture, and language of Russia and Eastern Europe.



**Prerequisite:** the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. Before acceptance into the program, all students must show evidence of satisfactory completion of two years of study of Russian or an appropriate East European language. In order to fulfill the language requirement, students must pass a proficiency-based reading test at a level equivalent to ILR R2. This almost always requires additional Russian language study. Under certain circumstances, an appropriate East European language at the same level of proficiency may be used to satisfy the language requirement. Credit for language study is not counted toward degree requirements.

**Required:** the general requirements stated under the Elliott School of International Affairs. The program consists of either a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. All students must take three courses in the required core field of Soviet internal and external affairs. Those in the 30-hour program prepare for two additional fields, while those in the 36-hour program prepare for three additional fields. Master's Comprehensive Examinations must be passed in each of the fields for which the student has prepared.

All students are expected to have background preparation of at least two courses in Russian history and one course in either Soviet government and politics or Soviet foreign policy. If any of the background courses are lacking, equivalent courses must be taken for graduate credit and can be counted toward degree requirements.

Of the three courses taken in the required core field, one must be in Soviet internal affairs and one in Soviet external affairs. Courses that satisfy the internal affairs requirement are Hist 246, PSc/Hist 258, PSc/Hist 232, and PSc 266 and 267. Courses that satisfy the external affairs requirement are Hist 255 and PSc 263 and 268. Students in the nonthesis program must prepare for a field in East European history or politics; those in the thesis program must take at least one course in East European history or politics.

Other fields in Russian and East European affairs are as follows. (1) Soviet and East European economics (Econ 267, 268, 367). (2) Ideology and political thought (PSc 207, 208). (3) Russian literature and culture (Slav 161-62, 165, 166). (4) Soviet military policy and strategy (Hist 135, 255-56; PSc 269). (5) Modern Russian history (Hist 217, 218, 246). (6) Comparative and international aspects of Communism (PSc/Hist 232; PSc 270). (7) East European history (Hist 205, 206). (8) East European government and politics (PSc 264, 265). (9) Advanced Soviet government, politics, and policy (PSc 267 is required; other courses are IAff 292; PSc 263, 266, 268; Hist 253-54, 259-60; Hist/PSc 232, 258; Geog 265).

**Concentration in Russian literature and culture**—Students may choose either the thesis or nonthesis option. They must take the required core field in Soviet internal and external affairs in addition to fields selected from (1) 19th-century Russian literature (Slav 126, 128, 141, 142, 152, 225, 254, 257); (2) Soviet literature (Slav 151, 165, 166, 255); (3) Russian culture (Slav 161-62).

The following courses are applicable to Russian and East European studies.

- |              |  |
|--------------|--|
| Econ 267     | Seminar: Soviet Economy  |
| Econ 268     | Seminar: Economic Theory and Development in Communist Countries      |
| Econ 367     | Seminar: Soviet Planning in Theory and Practice                      |
| Geog 265     | Seminar: Geography of the Soviet Union                               |
| Hist 188     | History of Chinese Communism   |
| Hist 205     | Readings Seminar: Eastern European History, 1772-1918                |
| Hist 206     | Readings Seminar: Eastern European History, 1919-1945                |
| Hist 217     | Readings/Research Seminar: Russian and Soviet Thought                |
| Hist 218     | Readings/Research Seminar: Soviet Nationalities                      |
| Hist/PSc 232 | Comparative Communist Systems I                                      |
| Hist/PSc 233 | Comparative Communist Systems II                                     |
| Hist 237     | Readings Seminar: Soviet Foreign Policy, 1917-1964                   |
| Hist 246     | Readings/Research Seminar: History of Modern Russia and Soviet Union |
| Hist 253-54  | Readings Seminar: History of Sino-Soviet Relations                   |
| Hist 255-56  | Readings Seminar: U.S.-Soviet Strategic Relations Since World War II |



- Hist/PSc 258 Communist Party of the Soviet Union  
 Hist 259-60 Research Seminar: Problems in U.S.-Soviet-Chinese Relations  
 IAff 292 Colloquium: The Soviet Union and Eastern Europe  
 PSc 207 Readings in Socialism and Communism  
 PSc 208 Readings in Marxism-Leninism  
 PSc 263 The Soviet Union and Europe  
 PSc 264 Governments and Politics of Eastern Europe  
 PSc 265 The International Politics of Eastern Europe  
 PSc 266 Readings in Soviet Government and Politics  
 PSc 267 Soviet Government and Politics  
 PSc 268 Soviet Foreign Policy  
 PSc 269 Soviet Military Policy and Strategy  
 PSc 270 Politics of the People's Republic of China I  
 Slav 126 Leo Tolstoy: His Life and Works  
 Slav 128 Dostoevsky: The Man and the Artist  
 Slav 141 Readings in 19th-Century Russian Prose  
 Slav 142 Readings in 19th-Century Russian Poetry  
 Slav 151 Readings in 20th-Century Prose  
 Slav 152 Readings in 20th-Century Poetry  
 Slav 161-62 Russian Culture  
 Slav 165 Modern Russian Literature from the Revolution to World War II  
 Slav 166 Modern Russian Literature from World War II to the Present  
 Slav 225 Pushkin and the Poets of His Time  
 Slav 254 Seminar: Literary and Intellectual Currents of the 1860s  
 Slav 255 Seminar: Main Trends in 20th-Century Russian Literature  
 Slav 257 Seminar: The 19th-Century Novel

### SANSKRIT

See Germanic Languages and Literatures.

### SCIENCE, TECHNOLOGY, AND PUBLIC POLICY—GRADUATE PROGRAM

**Program Committee:** R.W. Rycroft (Director), J.F. Coates, V.T. Coates, J.M. Logsdon, H.R. Nau, J.D. Rosendhal, M.B. Wallerstein

Master of Arts in the field of science, technology, and public policy—The Elliott School of International Affairs offers an interdisciplinary program that focuses on interactions among scientific development, technological change, and governmental activities, both domestically and internationally. The program is designed to train individuals to understand and manage issues of science and technology policy.

Prerequisite: the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. Required: the general requirements stated under the Elliott School. The program consists of 36 semester hours, which may include 6 hours of thesis research. Students must pass Master's Comprehensive Examinations in three fields, including science, technology, and public policy (PSc 222, 223, 252, and an elective approved by the advisor), public policy analysis (a minimum of two courses, usually drawn from Econ 211, 212; PSc 203, 204; PSc 253, 254; PAd 260, 261; or PAd 295, 296), and an elective field (a minimum of two courses, which may be a field offered in another Elliott School program, a field in an academic department, or a field in a specific issue area, such as space policy, trade policy, or environmental policy).

Students must demonstrate basic familiarity with concepts of economic theory, either by having taken prior course work beyond the introductory level or by taking Econ 217-18. Students must also satisfy a tool requirement in statistics or applied statistical methods, usually by successful completion of PAd 296 or Stat 105, 112, 183, or 197. In some cases, proficiency in a foreign language may be judged integral to the student's program of study; proficiency consists of reading knowledge as certified by the appropriate language department and will satisfy the tool requirement. Courses taken to fulfill the tool requirement may not be included in the 36 semester hours required for the degree.



The following graduate courses pertain to science, technology, and public policy:

Econ 235	Energy Resources and Policy
Econ 237	Economics of the Environment and Natural Resources
Mgt 230	Management of Research and Development
Mgt 231	Project Management
Mgt 232	International Science and Technology
Mgt 233	Emerging Technology
Mgt 235	Technological Entrepreneurship and Innovation
Mgt 239	Seminar: Management of Research and Development
Mgt 240	Survey of Information Systems
Mgt 244	Telecommunications: Technology, Applications, and Operations
Mgt 249	Seminar: Information Technology
PSc 222	Science, Technology, and Public Affairs
PSc 223	Science, Technology, and Public Policy
PSc 252	Science, Technology, and International Affairs
PSc 253	Defense Policy and Program Analysis I
PSc 254	Defense Policy and Program Analysis II
PAd 260	Policy Formulation and Administration
PAd 261	Policy Analysis in Public Administration
PAd 264	Public Program Analysis
PAd 270	Telecommunications Administration
PAd 271	Telecommunications Management
PAd 272	Telecommunications Finance
PAd 274	Regulation of Communications Common Carriers
PAd 275	Telecommunications Choices for Public Managers
PAd 296	Statistical Applications in Public Administration

#### SECURITY POLICY STUDIES—GRADUATE PROGRAM

**Program Committee:** W.H. Lewis (Director), B. Nimer, J.P. Rogers, R.W. Rycroft, B.M. Sapin, R. Thornton

**Master of Arts in the field of security policy studies**—This interdisciplinary program, offered by the Elliott School of International Affairs, prepares individuals for professional careers in defense planning and programming, policy formulation and implementation, intelligence evaluation, and arms control specialties.

**Prerequisite:** the admission requirements stated under the Elliott School of International Affairs and a bachelor's degree in a related field. **Required:** the general requirements stated under the Elliott School. The program consists of 36 semester hours in four fields; there is no thesis option. All students must take four courses in the required core field of national security and defense analysis (PSc 248, 249, 253, and 254). At least one field must be selected from the following. (1) International security policy (Hist 255-56; PSc 241, 257). (2) Military history (Hist 228, 229, 230-31). (3) Soviet military policy and strategy (Hist 255-56; PSc 268, 269). (4) Science, technology, and public policy (PSc 222, 252). (5) Applied quantitative techniques (PSc 255-56). Two elective fields are chosen in consultation with the advisor; Econ 217-18 must be included. The four fields must represent at least two academic disciplines; no more than 24 hours of course work may be taken in any one department or discipline.

Students must pass Master's Comprehensive Examinations in each of their four fields. With permission of the program director, a student may substitute one specially designed field consisting of two courses and submit a research paper in lieu of a Comprehensive Examination.

Basic familiarity with economic theory and concepts is required. The tool requirement must be satisfied by demonstration of proficiency in statistics (at the level of Stat 105, 112, 183, or 197) or reading knowledge of a modern foreign language (as certified by the appropriate language department).

In addition to the courses listed below, related courses in geography, public administration, and operations research may be taken with approval of the program director or an academic advisor.



## First Group

- 1-2 **First-Year Russian** (3-3)  
First part of beginning course in fundamentals of speaking, understanding, reading, and writing Russian. Slav 1 is prerequisite to Slav 2. Laboratory fee, \$35 per semester. (Academic year) Miller and Staff
- 3-4 **Second-Year Russian** (3-3)  
Second half of beginning course in fundamentals of speaking, understanding, reading, and writing Russian. Prerequisite to Slav 3: Slav 1-2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, \$35 per semester. (Academic year) Miller and Staff
- 5-6 **Intensive Beginning Russian** (6-6)  
Classroom (7 hours), laboratory (1 hour). Beginning intensive course in fundamentals of speaking, understanding, reading, and writing Russian (equivalent to Slav 1-2 and 3-4). Prerequisite to Slav 6: Slav 2 or 5. Laboratory fee, \$35 per semester. (Academic year) Thompson and Staff
- 9-10 **Third-Year Russian** (3-3 or 6-6)  
Practice in speaking, listening, reading, and writing at the intermediate level. Prerequisite: Slav 4, 6, or permission of instructor. Students receive 3 credits each semester unless they elect to take the course on an intensive basis, for which 6 credits can be earned, with an additional three hours per week of practice in language skills. (Academic year) Miller, Thompson, Robin
- 31-32 **Elementary Polish** (3-3)  
Beginning course in fundamentals of speaking, understanding, reading, and writing Polish. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, \$35 per semester. (Offered when the demand warrants) Staff
- 41-42 **Elementary Serbo-Croatian** (3-3)  
Beginning course in fundamentals of speaking, understanding, reading, and writing Serbo-Croatian. Prerequisite to Slav 42: Slav 41 or equivalent. (Offered when the demand warrants) Staff
- 47 **Beginning Russian for Reading** (3)  
For undergraduate and graduate students with little or no Russian who wish to acquire an elementary reading knowledge of the language. No academic credit for graduate students. (Summer) Staff
- 49 **Russian Reading** (3)  
Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Summer) Staff
- 51-52 **Elementary Bulgarian** (3-3)  
Beginning course in fundamentals of speaking, understanding, reading, and writing Bulgarian. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, \$35 per semester. (Offered when the demand warrants) Moser
- 71 **Soviet Civilization** (3)  
Survey of the Soviet Union's past and present development. Lectures, discussion, visual aids—in English. (Spring) Olkhovsk
- 91-92 **Introduction to Russian Literature** (3-3)  
Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. (Academic year) Moser

## Second Group

- 101-2 **Readings in the Soviet Press** (3-3)  
Representative reading and translation of Soviet periodicals and current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Academic year) Ficks
- 109-10 **Fourth-Year Russian** (3-3)  
Practice in speaking, listening, reading, and writing at the intermediate and advanced levels. Prerequisite: Slav 10 or permission of instructor. (Academic year) Staff
- 126 **Leo Tolstoy: His Life and Works** (3)  
(Formerly Slav 156)  
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Rus-



- sian literature and society. Lectures, reports, and classroom analysis of his major works—in English.
- 128 **Dostoevsky: The Man and the Artist** (3) Natov  
Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and western literature. Lectures, discussions, and reports—in English.
- 141 **Readings in 19th-Century Russian Prose** (3) Moser  
Reading of representative prose texts of the 19th century—in Russian. Prerequisite: Slav 10 or equivalent.
- 142 **Readings in 19th-Century Russian Poetry** (3) Moser  
Reading of representative poetry of the 19th century—in Russian. Prerequisite: Slav 10 or equivalent.
- 151 **Readings in 20th-Century Prose** (3) Moser  
Reading and discussion of representative prose of the 20th century—in Russian. Prerequisite: Slav 10 or equivalent.
- 152 **Readings in 20th-Century Poetry** (3) Moser  
(Formerly Russian Drama)  
Reading of representative poetry of the 20th century—in Russian. Prerequisite: Slav 10 or equivalent.
- 161-62 **Russian Culture** (3-3) Olkhovsky  
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports.
- 165 **Modern Russian Literature from the Revolution to World War II** (3) Natov  
Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English.
- 166 **Modern Russian Literature from World War II to the Present** (3) Natov  
Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s, 1970s, and 1980s. Lectures, discussions, reports—in English.
- 199-200 **Proseminar: Readings for the Major** (3-3) Staff  
Conferences and group discussions. (Academic year)
- Third Group**
- 211 **Russian Phonetics** (3) Robin  
Analysis of the sound system of standard contemporary Russian. An appropriate knowledge of Russian is required.
- 212-13 **Russian Structure** (3-3) Thompson  
Linguistic analysis of standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Fall)
- 214 **Methodology of Teaching Russian** (3) Thompson  
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: advanced proficiency (ACTFL-ETS) in Russian.
- 215 **Russian Historical Grammar** (3) Robin  
An analysis of the historical development of Russian phonology, morphology, and syntax. An appropriate knowledge of Russian is required. (Fall, odd years)
- 218 **History of the Russian Literary Language** (3) Moser  
The development of the norms of the Russian literary language from earliest times to the present. An appropriate knowledge of Russian is required. (Spring, even years)
- 220 **Russian Stylistics** (3) Staff  
Analysis of various styles of contemporary Russian from the point of view of vocabulary and structure—in Russian. (Spring, odd years)



- 224 **Russian Literature to 1800** (3)  
Survey of Russian literature from the earliest times to the end of the 18th century.  
Appropriate knowledge of Russian required. Moser
- 225 **Pushkin and the Poets of His Time** (3)  
Pushkin's predecessors; Pushkin's poetry and drama; Lermontov, the heir to Pushkin's poetic tradition—in Russian. (Fall, odd years) Staff
- 241 **Russian-English Oral Translation** (3)  
Practice in oral translation from Russian into English. Prerequisite: Slav 109-10 or equivalent. Olkhovsky
- 242 **Advanced Spoken Russian** (3)  
Advanced practice in the spoken Russian language. Prerequisite: Slav 109-10 or equivalent. Thompson
- 254 **Seminar: Literary and Intellectual Currents of the 1860s** (3)  
Discussion of literary and intellectual developments in Russia of the 1860s.  
Appropriate knowledge of Russian required. (Spring, odd years) Moser
- 255 **Seminar: Main Trends in 20th-Century Russian Literature** (3)  
Study of representative works since 1900; their artistic and social value—in Russian. (Spring, even years) Staff
- 257 **Seminar: The 19th-Century Novel** (3)  
Reading and analysis of selected examples of the Russian novel of the 19th century (Dostoevsky, Tolstoy, Turgenev)—in Russian. (Fall, even years) Staff
- 290 **Special Topics in Russian** (3)  
Topics in Russian literature or linguistics. May be repeated for credit. Staff
- 295 **Independent Reading and Research** (arr.)  
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring)

## SOCIOLOGY

University Professor A. Etzioni  
Professors R.W. Stephens, R.G. Brown (Chair), T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace, P. Langton, W.J. Chambliss  
Adjunct Professor S.J. Rogers  
Associate Professors J.L. Tropea, S.A. Tuch  
Assistant Professor R. Weitzer

*Bachelor of Arts with a major in sociology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.
4. Required courses in the major—Soc 103, 140-41, 191, and 15 additional semester hours in second-group sociology courses. Soc 101 and 102 are strongly recommended.

*Bachelor of Arts with a major in criminal justice (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite course—Soc 1.
3. Required courses in related areas—Anth 156, Phil 142, PSc 115, and Psyc 130 and 154
4. Required courses in the major—Soc 3, 135, 136, 137, 139, 151, plus three additional second-group sociology courses.

*Minor in sociology*—A minimum of 15 hours of course work, including Soc 1 and one course chosen from Soc 101, 102, 103, and 140, plus 9 hours of electives in courses at the 100 level or higher. Departmental advising is required.



*Master of Arts in the field of sociology*—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences. With the approval of the advisor and of the Admissions/Advising Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to 6 semester hours) and satisfactory completion of a Master's Comprehensive Examination in either sociological theory or social research methods; or (2) at least 33 semester hours of graduate course work, satisfactory completion of a Master's Comprehensive Examination in either sociological theory or social research methods, and one substantive special field (criminology/sociology of law, gender, medical sociology/health policy, race and ethnicity, and theory). Six semester hours may be taken outside the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Candidates must select from the graduate sociology courses as follows: 6 hours chosen from sociological theory (Soc 238 and 239), 6 hours of social research methods (Soc 230 and 232), and 6 hours chosen from one area of specialization (criminology/sociology of law, gender, medical sociology/health policy, race and ethnicity, and theory).

*Doctor of Philosophy in the field of sociology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 24 to 30 semester hours of graduate course work, 6 to 10 hours of specialized research, and 12 to 18 hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study at least 3 hours of course work in sociological theory (either Soc 338 or 339); 6 hours in research methods (Soc 231 and a qualitative methodology course selected from the following: Soc 332, Educ 282, Phil 255, AmCv/Anth/Hist 197, W/Stu 221, Anth 200).

Students must satisfactorily complete the General Examination in either sociological theory or social research methods and one substantive area of specialization.

**Departmental prerequisite:** Soc 1 is prerequisite to all sociology courses except Soc 3 and 181.

### First Group

- 1 **Introductory Sociology** (3) Staff  
General principles of sociology; development of culture and personality, impact of groups and institutions on social behavior. (Fall and spring)
- 2 **Major Social Issues** (3) Staff  
Critical examination of selected social issues in contemporary American society. (Fall and spring)
- 3 **Introduction to Criminal Justice** (3) Chambliss, Courtless, Tropea, Weitzer  
An introduction to the study of criminal justice. The historical development of criminal justice and its evolution into modern legal systems. The impact of different forms of criminal justice on society and the individual. (Fall and spring)

### Second Group

- 101 **Development of Social Thought** (3) Lengermann  
An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)
- 102 **Modern Sociological Theory** (3) Wallace, Lengermann  
Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. (Spring)
- 103 **Major Sociological Perspectives** (3) Lengermann, Wallace  
An examination of the development and contemporary content of the major theoretical perspectives guiding sociological work. Theories include functionalism, exchange theory, critical theory, conflict theory, symbolic interactionism, and phenomenology. (Fall and spring)



- 120 **Sociology and Public Policy** (3)  
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy. Staff
- 122 **Death and Dying: A Sociological Perspective** (3)  
(Formerly Soc 160)  
Processes of death and dying examined from the perspectives of dying persons, their families and professionals. Death as a social institution and various social issues surrounding death, such as suicide, euthanasia, capital punishment, and death-related social movements, are analyzed. (Spring) Brown, Langton
- 124 **Medical Sociology** (3)  
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall) Langton, Brown
- 125 **Sociology of Religion** (3)  
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years) Wallace, Yeide
- 126 **Urban Sociology** (3)  
The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt. (Fall) Staff
- 127 **Social Demography** (3)  
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall) Langton
- 129 **Race and Minority Relations** (3)  
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring) Stephens, Tuch
- 130 **Class and Inequality in American Society** (3)  
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies that affect these distributions. (Fall) Tuch, Brown
- 132 **The Family in Modern Society** (3)  
An examination of the stages of family life: birth, childhood, premarital relationships, marriage and sex roles in marriage, retirement and old age. Special emphasis on development and maintenance of interpersonal relations. (Fall) Stephens
- 133 **Learning and the Life Cycle** (3)  
Sociological approaches to learning from childhood through adolescence and adulthood. Emphasis on the impact of social institutions and group interaction on the learning process. (Spring) Tropea, Wallace
- 134 **Violence and the Family** (3)  
Comparative approach to power and violence in family systems. Analysis of devaluation of family relations. Critical survey of explanations of violence and responses made to it. (Fall) Tropea
- 135 **Youth and Delinquency** (3)  
A criminal justice course. Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring) Chambliss, Courtless, Tropea
- 136 **Criminology** (3)  
A criminal justice course. Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. Analysis of the historical, social, legal, and cultural conditions affecting the nature of crime, criminality, and the development of state responses made to it. (Fall) Chambliss, Tropea, Courtless
- 137 **Sociology of Law** (3)  
A criminal justice course. Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall) Chambliss, Courtless, Tropea, Weitzer



- 138 **Alcohol, Alcoholism, and Society** (3) Langton  
An overview of alcohol use and abuse in American society; impact on work, family, and crime; policies and legislation for social control of problem drinking and alcoholism. (Spring)
- 139 **Deviance and Control** (3) Chambliss, Tropea, Courtless, Weitzer  
A criminal justice course. Analysis of the creation of deviance through collective definitions and responses. Development of a perspective on processes of becoming deviant. (Spring)
- 140 **Social Research Methods** (3) Tuch  
Introduction to basic research methods in sociology. Topics include research design, sampling, measurement, and elementary data analysis via computer application. (Fall)
- 141 **Techniques of Data Analysis** (3) Tuch  
Continuation of Soc 140. Examination of a range of topics in the statistical analysis of sociological data, with a strong emphasis on computer applications. Prerequisite: Soc 140. (Spring)
- 143 **Social Movements** (3) Stephens  
General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)
- 144 **Sociology of Terror** (3) Courtless, Chambliss  
Examination of contemporary terrorism, using historical and sociological perspectives. The state and terrorism (the state as terrorist, state-supported terrorism, and the limitations and possibilities of state response to the threat of terrorism). (Spring)
- 152 **Field Experience in Sociology** (9) Staff  
Development of a comprehensive perspective and applied skills in selected social systems through seminars, readings, research, and field placement. Requires 16 hours of field work weekly. Recommended for juniors and seniors. Open to all but majors in criminal justice. Topics include health, aging, and family. (Fall or spring)
- 155 **Sociology of Sex and Gender** (3) Wallace, Lengermann  
The roles of women and men from social structural and social psychological perspectives. Analysis of gender inequality in such areas as the family, the workforce, the media, politics, law, religion, and education. (Fall)
- 181 **Special Topics in Sociology** (3) Staff  
Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall)
- 191 **Senior Seminar** (3) Staff  
A final review of the field for sociology majors nearing graduation. The course emphasizes the integration of theory and research, critical reflection and evaluation, and recent developments in sociology. Required for all sociology majors. Prerequisites: Soc 103, 140, and 141. (Fall and Spring)
- 192 **Field Experience in Criminal Justice** (9) Courtless, Tropea  
(Formerly Soc 151)  
Experientially based learning of the administration of justice through field placements in legislative and policymaking domains and in institutions of juvenile and criminal justice. Academic evaluation predicated on independent readings, research, journals, and seminar participation. Sixteen hours of field work and four hours of seminar required weekly. Admission by permission of criminal justice advisors. (Fall, spring, and summer)
- 195 **Research** (1, 2, or 3) Staff  
Independent study and special projects. Open only to selected undergraduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing the research. (Fall and spring)



## Third Group

- 203 **Social Organization** (3)  
Introduction to sociological concepts and perspectives. An examination of empirical studies that utilize different theoretical perspectives. Recommended for students offering sociology as a supporting field. (Fall) Lengermann
- 210 **Theoretical Foundations of Political Sociology** (3)  
Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict and change. Wallace, Yeide
- 220 **Seminar: Sociology of Religion** (3)  
Analysis of theoretical and empirical approaches to the study of religion as a social phenomenon. Both classical and contemporary contributions will be examined. Among the topics are secularization, new religious movements, and modes of religious organization. (Spring, even years) Lengermann
- 225 **Theories of Social Change** (3)  
Review of sociological writings on modernity—its emergence in the North Atlantic societies, its consequences for third world societies, and its future. (Spring) Tuch
- 230 **Sociological Research Methods** (3)  
Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Stat 105 or equivalent. (Fall) Tuch
- 231 **Seminar: Advanced Research Methods** (3)  
Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite: Soc 230. (Spring) Langton, Weitzer
- 232 **Qualitative Methodology: Doing Field Research** (3)  
Practical application of data collection methods in natural settings; observation, participant observation, and field experience. Emphasis on implementing research projects by using these methods for purposes of developing empirically grounded theory. Wallace, Tropes
- 235 **Seminar: Sociology of Education** (3)  
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years) Lengermann
- 238 **Seminar: Development of Sociological Theory** (3)  
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall) Lengermann, Wallace
- 239 **Seminar: Modern Sociological Theory** (3)  
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring) Langton
- 240 **Sociology of Work and Occupations** (3)  
Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations. (Fall) Langton
- 241 **Sociology of Work and Organizations** (3)  
Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision making, recruitment, allocation of authority, informal organization, and interorganizational relations. (Spring) Langton
- 242 **Seminar: Sociology of Health and Illness** (3)  
Study of the social structure of health care and the interplay of the various health professions; examination of social factors and processes related to the etiology and treatment of illnesses. (Fall) Tuch
- 245 **Seminar: Race Relations** (3)  
Systematic analysis of race relations and inequality, primarily in the United States. (Fall) Tuch



- States. Topics include current status and recent trends in inequality, the institutional and organizational patterning of discrimination, the structure of white racial attitudes, theoretical perspectives on race relations, and selected policy issues. (Spring) Staff
- \*254 **Evaluative Research** (3) Staff  
Systematic survey of conceptualization, design, and practice of evaluative research of social experiments and of simulation and technological forecasting. (Spring, even years)
- \*256 **Selected Topics in Social Policy Analysis** (3) Staff  
A sociological perspective on selected policy areas, including urban planning, education, family, aging, health, affirmative action, law enforcement, and economic development. Particular policy areas will be rotated year by year. Course may be repeated for credit.
- \*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Chambliss, Courtless, Tropea  
Same as Law 478(2). (Fall)
- \*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Chambliss, Courtless, Tropea  
Same as Law 479(2). (Spring)
- \*263 **Seminar: Law and Society** (3) Chambliss, Courtless  
Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)
- \*265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Chambliss, Courtless, Tropea  
Development of a systematic perspective on policies affecting the juvenile and criminal justice systems. Topics will include adjudication, disposition, diversion, and sentencing. (Spring, even years)
- \*270 **Seminar: Foundations of Social Inequality** (3) Stephens  
Review of the principal concepts and theories used to explain social inequality at both macro and micro levels. Examination of principal bases of inequality and their representative forms. (Prerequisite course for students electing social inequality as a major field.) (Fall)
- \*271 **Seminar: Gender and Society** (3) Lengermann, Wallace  
An examination of quantitative and qualitative research in the field of gender, with emphasis on current empirical research. (Fall)
- \*272 **Seminar: Theoretical Perspectives on Gender** (3) Lengermann, Wallace  
Review of significant theoretical writings on gender and gender inequality, with a primary focus on contemporary sociological statements. (Spring)
- \*280 **The Sociology of Aging** (3) Brown  
Impact of current demographic changes (size and composition of the aged population) on the existing structure of American society. (Spring)
- \*281 **Problems of Growing Old in American Society** (3) Brown  
Analysis of the bases of the social status of the aged in American society, the impact on older people of characteristic situational changes in later life, and societal responses to those impact areas defined as social problems. (Fall)
- \*290 **Principles of Demography** (3) Boulrier  
Same as Econ/Geog/Stat 290.
- \*291 **Methods of Demographic Analysis** (3) Boulrier  
Same as Econ/Geog/Stat 291.
- \*295 **Research** (arr.) Staff  
Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

\* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to 1 additional semester hour. For description of the courses, see the National Law Center Bulletin.



299-300 **Thesis Research** (3-3)  
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. Other graduate students are permitted at the discretion of the department or the instructor.

332 **Seminar: Processes of Inquiry** (3)

Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite; at least 3 semester hours each of graduate theory and graduate methods. May be repeated for credit. Chambliss, Lengermann, Wallace

338 **Advanced Seminar:**

**Classical Sociological Theory** (3)

Intensive investigation of special topics in classical sociological theory. Prerequisite: Soc 238 and 239. (Spring) Chambliss, Lengermann, Wallace

339 **Advanced Seminar:**

**Modern Sociological Theory** (3)

Intensive investigation of special topics in modern sociological theory. Prerequisite: Soc 238 and 239. (Fall) Chambliss, Lengermann, Wallace

342 **Advanced Seminar on Health Policy** (3)

Review of how health policy is made and implemented; how health policy research is done; in-depth review of selected topics and completed policy studies, primarily for students in the medical/health policy field. Prerequisite: Econ 248, Soc 242 or consent of the instructor. (Spring) Langton

351 **Selected Topics in Sociology** (3)

Intensive investigation of special topics in sociological theory. May be repeated for credit. (Fall) Staff

352 **Selected Topics in Sociology** (3)

Intensive investigation of special topics in sociological research. May be repeated for credit. (Spring) Staff

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff

399 **Dissertation Research** (arr.)

Limited to Doctor of Philosophy candidates. May be repeated for credit. and spring) Staff

**SPANISH**

See **Romance Languages and Literatures.**

**SPECIAL EDUCATION**

See **Teacher Preparation and Special Education.**

**SPEECH AND HEARING**

Professors J.W. Hillis, L.S. Bowling, C.W. Linebaugh (Chair)  
Associate Professors M.D.M. Brewer, J.R. Regnell

Bachelor of Arts with a major in speech and hearing science (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—Comm 1; Psyc 121 and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.
3. Required courses in the major—SpHr 11, 101, 102, 103, 104, 108, 118, 119, 120.



Minor in speech and hearing—15 semester hours are required, including SpHr 11, 101, 103, and at least 6 semester hours of second-group courses to be selected from SpHr 102, 104, 108, 118, 119, and 120.

*Master of Arts in the field of speech-language pathology and audiology*—Prerequisite: the degree of Bachelor of Arts with a major in speech and hearing science from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 39 semester hours of approved course work without a thesis or, with the approval of the department, 27 semester hours of approved course work plus a thesis (equivalent to 6 semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association and satisfactorily complete the Master's Comprehensive Examination.

As one component of the Master's Comprehensive Examination, all students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of test scores to the Department of Speech and Hearing to be used in partial fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Test results must reach the department at least three weeks before graduation.

**Speech and Hearing Therapy:** See the Speech and Hearing Center.

#### First Group

- 11 **Voice and Diction** (3) Regnell, Bowling  
Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, \$5. (Fall, spring, and summer)

#### Second Group

- 101 **Hearing Science** (3) Brewer  
Anatomy and physiology of the auditory mechanism; basic acoustics and psychoacoustics. Theories of hearing and frequency and intensity perception. (Fall)
- 102 **Neural Substrates of Speech, Hearing, and Language** (3) Linebaugh  
Neuroanatomy and neurophysiology as they relate to speech, hearing, and language. Emphasis on sensory and motor systems and neuroanatomical correlates of language processing; neurolinguistics. (Spring)
- 103 **Speech Science** (3) Linebaugh  
Functions of the respiratory, laryngeal, and orofacial structures in normal speech production; physiological and acoustic phonetics. (Fall)
- 104 **Speech and Language Disorders** (3) Regnell  
Survey of the nature and causes of developmental and acquired disorders of speech and language. Emphasis on prevention and effective communication with persons having a speech-language impairment. (Spring)
- 108 **Introduction to Audiology** (3) Brewer  
Survey of the field of audiology, including the measurement of hearing, the nature and causes of hearing impairment, hearing aids and habilitation/rehabilitation of the hearing impaired. Prerequisite: SpHr 101. (Spring)
- 118 **Structure and Analysis of Speech and Language** (3) Staff  
Semantic, morphologic, syntactic, phonologic, and pragmatic aspects of language. Methods for the analysis of speech and language, including practice in phonetic/phonemic transcription. (Fall)
- 119 **Experimental Analysis of Communication Behavior** (3) Hillis  
Observation and measurement of speaker-listener performance. Review of literature on assessment of speaker-listener behavior; study of acoustic, behavioral,



- and linguistic properties of speaker intelligibility and credibility; application of behavioral observation and computer technology in identification, measurement, and modification of speaker-listener attributes. Students desiring laboratory credit for this course may register additionally for 1 semester hour of SpHr 196. Prerequisite: Comm 1 or SpHr 11. (Fall) Staff
- 120 **Speech and Language Development** (3)  
Development of speech, language, and auditory and related cognitive processes. Application of analytic methods to developmental and cultural variations in speech and language. Prerequisite: SpHr 118 or equivalent. (Spring) Staff
- 196 **Independent Study** (1 to 6)  
Independent research and special projects. Before students are permitted to register for SpHr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will direct the study and of the department chair.

### Third Group

- 201 **Clinical Practicum in Communication Disorders** (1 to 3)  
Supervised clinical practice in the evaluation and treatment of speech, language, and hearing disorders; development of treatment plans and writing of evaluation and progress reports. Admission by permission of the instructor. May be repeated for up to 6 credit hours. (Fall, spring, and summer) Bowling
- 267 **Industrial Audiology** (3)  
Theories and processes pertinent to communicative disorders related to industrial noise. Consideration of hearing conservation programs, environmental assessment, and relevant legislation. (Fall) Bowling
- 268 **Selected Topics in Clinical Audiology** (1 to 3)  
Advanced study of selected theoretical and clinical issues. May be repeated, but may not be taken for more than a total of 3 semester hours of credit. (Fall) Bowling
- 269 **Management of Clinical Services in Communication Disorders** (3)  
Planning, management, and operation of clinic, hospital, school, and private practice services in speech-language pathology and audiology. Consideration of personnel, financial, and space issues; ethical and legislative concerns. (Fall) Bowling
- 270 **Pediatric Audiology** (3)  
Embryologic development of the auditory mechanism. Nature and causes of auditory impairments; audiometric techniques used to measure hearing in children. Laboratory fee, \$7.50. (Spring) Staff
- 271 **Congenital Disorders of Speech Production** (3)  
Evaluation and treatment of infants and children with congenital speech disorders, including cerebral palsy and cleft palate. Emphasis on management of prespeech oral motor and feeding impairments. Laboratory fee, \$7.50. (Summer) Staff
- 272 **Disorders of Speech Articulation** (3)  
Nature and causes of developmental articulation disorders. Differential diagnosis and treatment of articulation disorders, including phonological impairment and developmental apraxia of speech. Laboratory fee, \$7.50. (Fall) Staff
- 273 **Pediatric Language Impairments: Identification and Diagnosis** (3)  
Review of current theoretical approaches to evaluation; differential diagnosis of developmental language delays and disorders; review of available standardized tests; observation and testing experience. Laboratory fee, \$7.50. (Fall) Staff
- 274 **Pediatric Language Impairments: Treatment** (3)  
Review of current therapeutic models; use of diagnostic information for designing a treatment plan; monitoring progress; coordinating language remediation with classroom and additional resource support; experience through monitoring ongoing language treatment. Laboratory fee, \$7.50. (Spring) Hillis
- 275 **Evaluation and Treatment of Speech Fluency Disorders** (3)  
Procedures for clinical assessment of stuttering and other disorders of speech rate



- and rhythm. Review of historical and current methods for treatment. Laboratory fee, \$7.50. (Spring)
- 276 **Seminar: Speech Fluency Disorders (3)** Hillis  
Consideration of stuttering and other disorders of speech rate and rhythm from developmental, linguistic, physiological, and psychosocial points of view. (Fall)
- 277 **Clinical Aphasiology (3)** Linebaugh  
Current neurolinguistic theories. Differential diagnosis and clinical management of aphasia and communicative impairments resulting from right cerebral hemisphere damage, traumatic brain injury, and dementia. Laboratory fee, \$7.50. (Fall)
- 278 **Applied Neurolinguistics (3)** Linebaugh  
Neurolinguistic and cognitive processes of language formulation and comprehension. Application of neurolinguistic models to neurogenic communicative disorders. (Summer)
- 279 **Motor Speech Disorders (3)** Linebaugh  
Methods for assessing motor speech disorders and their physical, acoustic, and perceptual characteristics. Differential diagnosis and treatment of apraxia of speech, the dysarthrias, and dysphagia. Laboratory fee, \$7.50. (Spring)
- 280 **Evaluation and Treatment of Voice Disorders (3)** Regnell  
Normal anatomy and physiology of the human vocal mechanism. Nature, causes, and clinical management of functional and organic voice disorders, including laryngectomy. Laboratory fee, \$7.50. (Fall)
- 281 **Seminar: Voice Disorders (3)** Regnell  
Advanced study of selected theoretical and clinical issues regarding voice disorders. (Summer)
- 283 **Aural Rehabilitation (3)** Brewer  
Habilitation/rehabilitation of the hearing impaired, including auditory training, speech reading, hearing aids, assistive listening devices, communication strategies, and counseling. Laboratory fee, \$7.50. (Fall)
- 284 **Clinical Audiology I (3)** Brewer  
Psychoacoustic principles and methods underlying the assessment of auditory disorders. Anatomy and physiology of the auditory mechanism. Laboratory fee, \$7.50. (Fall)
- 285 **Hearing Aids (3)** Staff  
Discussion of hearing-aid characteristics and electroacoustic measurements; hearing-aid effectiveness in improving communicative efficiency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. Laboratory fee, \$7.50. (Spring)
- 286 **Electrophysiologic Assessment of Hearing (3)** Bowling  
Study of electrophysiologic techniques used to assess cochlear and retrocochlear function. Theories and clinical applications of vestibular tests, auditory brainstem-evoked responses, and electrocochleography. Laboratory fee, \$7.50. (Spring)
- 287 **Central Auditory Processes (3)** Bowling  
Factors affecting auditory perception and comprehension. Identification and clinical management of central auditory processing disorders in children and adults. Laboratory fee, \$7.50. (Fall)
- 288 **Psychoeducational Management of the Hearing Impaired (3)** Staff  
Study of the psychosocial and educational effects of hearing loss. Assessment, remediation, and management approaches related to the education of the hearing impaired. Laboratory fee, \$7.50. (Summer)
- 289 **Clinical Audiology II (3)** Staff  
Audiological assessment of middle ear function, speech audiometry, and management of diagnostic information. Laboratory fee, \$7.50. (Fall)
- 290 **Selected Topics in Developmental Language Disorders (1 to 3)** Staff  
Advanced study of selected theoretical and clinical issues regarding developmental language disorders. May be repeated, but may not be taken for more than a total of 3 semester hours of credit. (Summer and fall)



**292 Research Methods in Speech and Hearing (3)**

Methods for the design and execution of research in speech and hearing. Topics include hypothesis formulation, literature review, proposal preparation, data acquisition and analysis, and preparation of final research reports. Laboratory fee, \$7.50. (Spring)

**295 Independent Research in Speech, Language, and Hearing (arr.)****299-300 Thesis Research (3-3)**  
(Fall and spring)**STATISTICS/COMPUTER AND INFORMATION SYSTEMS**

Professors H.W. Lilliefors, A.D. Kirsch, J.L. Gastwirth, S.W. Greenhouse (Emeritus), N.D. Singpurwalla, R.T. Smythe (Chair), J.M. Lachin III, J.D. Knoke (Research)

Adjunct Professor N.J. Kirkendall

Professorial Lecturers J. Kullback, F. Ponti, W.J. Smith, W.R. Nunn

Associate Professors R.E. Thomas, P.F. Thall, S.E.F. Schlesselman (Research)

Associate Professorial Lecturers R. Jacob, T.C. Teeple, R.F. Teitel, J.S. Wu

Assistant Professors R.P. Bain (Research), H.M. Mahmoud, T.K. Nayak, D.A. Grier

R.G. Epstein, B. Toman

Assistant Professorial Lecturer A. Chu

Bachelor of Arts or Bachelor of Science with a major in statistics (departmental), statistics with an option in computer science (departmental), or computer and information systems (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses for all majors—Math 31, 32, 33; Stat 91 (except computer and information systems majors).
3. Required courses for all majors—Math 124; Stat 129, 130.
4. (a) Required courses for the statistics major—Stat 118, 119, 157-58, 189, plus three approved second-group courses in statistics.  
(b) Required courses for the statistics major with an option in computer science—Stat 118, 119, 131, 157-58, plus three approved second-group computer related courses. Math 105 is recommended.  
(c) Required courses for the computer and information systems major—Stat 131, 132, 133, 134, 135, 142, 157-58 or 189-90, plus two approved courses from Stat 145, 146, 147, 148, 149, 150. Math 105 is also recommended.
5. Students interested in eventually pursuing a Ph.D. program in statistics are advised to take Stat 190, Math 139 and 140, and two years of a foreign language. Math 157 is also recommended.
6. To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should check with the Department.

Minor in statistics—18 hours of approved courses in this department, including an introductory statistics course, Stat 118, and one computer course.

Minor in computer science—18 hours of approved courses in this department, including Stat 129, 130, and 131, and two additional computer courses selected with approval of advisor.

Master of Science in the field of applied statistics, Master of Science in the field of statistical computing, or Master of Arts in the field of mathematical statistics—The program of study consists of 30 to 36 semester hours of course work without a thesis. In exceptional cases the department may approve a program of study consisting of 24 to 30 semester hours of course work plus a thesis, equivalent to 6 additional semester hours. Candidates must pass a written Master's Comprehensive Examination. For prerequisites and additional requirements, see below.

Master of Science in the field of applied statistics—Two options are provided: a general curriculum in applied statistics and a concentration in biostatistics. Prerequisite: Math 31.



32, 33, and 124; Stat 118 and 157-58. (Stat 157-58 is not required if Stat 201-2 is included in the program.)

**Required:** the general requirements stated under the Graduate School of Arts and Sciences and 30 to 36 semester hours of course work. If the student has not previously had Stat 119 or equivalent, the program must include Stat 221 or 217-18. Courses are selected in consultation with the advisor.

(a) *General curriculum in applied statistics*—The core curriculum includes Stat 201-2 and 210. An additional 21 semester hours must be chosen in consultation with the advisor.

(b) *Concentration in biostatistics*—The core curriculum includes Stat 187, 201-2, 210, 225-26, 227, 231. Twelve additional semester hours are electives of which 6 hours must be in statistics and 6 hours must be in health sciences or related areas. All electives must be approved by the advisor.

*Master of Science in the field of statistical computing*—Prerequisite: Math 31, 32, 33, and 124; Stat 118, 130, 131, and 132, or demonstrated proficiency in advanced programming techniques.

**Required:** the general requirements stated under the Graduate School of Arts and Sciences and 30 to 36 semester hours of course work. The 24-hour core consists of 201-2, 203, 204, 207-8, 210, and 283. Students entering the program without a strong background in statistics will be expected to take at least 3 semester hours of options in statistics.

*Master of Arts in the field of mathematical statistics*—Prerequisite: a bachelor's degree with a major in statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study. Additional prerequisites include Math 139 and 140. Under certain circumstances some prerequisites may be waived; check with the department.

**Required:** the general requirements stated under the Graduate School of Arts and Sciences, including Stat 201-2 and 217-18. The remaining 18 semester hours must be selected in consultation with the advisor.

*Doctor of Philosophy in the field of statistics*—Prerequisite: A master's degree in statistics or a related discipline. The main requirement is a strong background in mathematics, including courses in advanced calculus, linear algebra, and mathematical statistics (similar to Stat 201-2). Some deficiencies may be made up concurrently during the student's first year. In some instances, a student may enter the Ph.D. program with a bachelor's degree.

**Required:** The general requirements stated under the Graduate School of Arts and Sciences, including satisfactory completion of (1) Stat 201-2, 217-18, 257, 258, 263, 264, and a minimum of 24 additional semester hours as determined by consultation with the departmental doctoral committee; (2) proficiency in computer languages as demonstrated by course work or an examination; (3) the General Examination, consisting of two parts: (a) a written qualifying examination that must be taken within 24 months from the date of enrollment in the program and is based on the four-course core (Stat 257, 258, 263, 264) and (b) an examination to determine the student's readiness to carry out the proposed dissertation research; and (4) a dissertation demonstrating the candidate's ability to do original research in one of the following fields: Bayesian inference, biostatistics, design of experiments, multivariate analysis, nonparametric statistics, probability (theoretical or applied), reliability theory, robust methods, sampling, statistical inference, stochastic processes, and time series.

**Departmental prerequisite:** One entrance unit in algebra is prerequisite to all first-group courses in statistics.

### First Group

\*51 **Introduction to Business and Economic Statistics** (3)

Staff

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, probability distributions, sampling, estimation, tests of hypotheses, regression and correlation, index numbers. (Fall and spring)

\* Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit for only one of the six may be applied toward a degree.



**\*53 Introduction to Statistics in Social Science (3)**

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring) Staff

**\*91 Principles of Statistical Methods (3)**

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. Primarily for students in the natural sciences. (Fall) Staff

**Second Group****103 Sampling in Accounting (3)**

Special emphasis on applications of sampling techniques and design to accounting problems. Prerequisite: Stat 51, 53, 91, or equivalent. (Fall and spring) Staff

**\*104 Statistics in Management, Administration, and Policy Studies (3)**

Lecture (3 hours), laboratory (1 hour). Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training. Staff

**105 Statistics in the Behavioral Sciences (3)**

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, non-parametric techniques, sampling theory. Prerequisite: Stat 53, 104, or equivalent, and satisfactory performance on a placement examination. (Fall and spring) Kirsch

**\*111 Business and Economic Statistics I (3)**

Descriptive statistics, graphical methods, probability, special distributions, random variables, sampling, correlation, estimation and confidence intervals, hypothesis testing. (Fall) Staff

**112 Business and Economics Statistics II (3)**

Continuation of Stat 111, with emphasis on techniques of regression, chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring) Staff

**118 Regression Analysis (3)**

Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. (Fall and spring) Thall, Lilliefors

**119 Analysis of Variance (3)**

Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; randomized block, factorial, Latin square designs, and analysis of covariance. Prerequisite: Stat 118. (Spring) Staff

**123 Introduction to Econometrics (3)**

Same as Econ 123. Staff

**\*127 Statistics for the Biological Sciences (3)**

Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring) Staff

**+129 Introduction to Computing (3)**

Computer and programming concepts; algorithm development. Emphasis on careful construction and implementation of programs using structured programming techniques and a high-level language. (Fall and spring) Staff

**130 Computer Programming (3)**

Development of advanced computing ideas: records, recursion, sets, pointer variables and dynamic storage. Introduction to data structures: stacks, queues, linked lists, and binary search trees. Prerequisite: Stat 129 or equivalent. (Fall and spring) Thomas and Staff

\* Stat 51, 53, 91, 104, 111, and 127 are related to their subject matter, and credit for only one of the six may be applied toward a degree.

+ Credit will not be given for both Stat 129 and 197.



- 131 **Data Structures and Algorithms** (3) Thomas  
Analysis of algorithms. Abstract data types. Development and application of advanced data structures; priority queues, multilinked lists, sparse matrices, B-trees, tree balancing, and graphs. Sorting and searching algorithms. Prerequisite: Stat 130 or equivalent. (Fall and spring)
- 132 **Introduction to Discrete Structures** (3) Mahmoud  
Joint offering of the Statistics and Mathematics Departments. Discrete structures and associated mathematical tools. Topics include sets, functions, relations, directed and undirected graphs, propositional calculus, Boolean algebras, with applications to computer science. Prerequisite: Stat 130 and Math 31. (Fall)
- 133 **Computer Organization and Assembly Language** (3) Jacob  
Data representation and arithmetic; computer structure and machine language; computer architecture. Assembly language; addressing techniques; file input and output. Study of an actual small computer. Prerequisite: Stat 130. (Fall)
- 134 **Operating Systems** (3) Jacob  
Techniques for handling simultaneous processes; dynamic procedure activation; synchronization and mutual exclusion; semaphores. Operating system design methodologies; abstract data types; monitors; kernels. Memory management; memory hierarchy; paging. Recovery procedures. Prerequisite: Stat 133. (Spring)
- 135 **Survey of Programming Languages** (3) Staff  
Structured and nonstructured languages; list-structured languages; pattern matching and symbol manipulation languages; interpretive and interactive languages; variable binding. Prerequisite: Stat 131. (Spring)
- 142 **Introduction to Automata Theory** (3) Mahmoud  
Finite state automata. Turing machines and computability; universal Turing machine; computable and noncomputable functions; halting problem; computational complexity. Formal grammars and their relationship to automata. Prerequisite: Stat 130 and Math/Stat 132. (Spring)
- 145 **Compiler Design** (3) Staff  
Grammars, languages, syntax, and semantics. Lexical analysis; symbol tables; context-free language parsing techniques; code generation. Prerequisite: Stat 131. (Spring)
- 146 **Design and Development of Software** (3) Epstein  
Design techniques; structured programming; code reading; stepwise refinement; top-down design; information hiding; coupling and cohesion. Development of a multicomponent software project by students. Prerequisite: Stat 131. (Fall)
- 147 **Artificial Intelligence** (3) Staff  
Representation of knowledge; notational systems such as logics, programming languages, trees, and networks; LISP. Search strategies; heuristics; production rule systems. Algorithms used in AI; natural language processing, vision, manipulator operation, theorem proving, problem solving. Prerequisite: Stat 131. (Fall)
- 148 **Database Systems** (3) Epstein  
Sequential file processing; random access storage. Hierarchical, network, and relational data models. Data normalization; data description languages; query facilities. File and index organization; inverted files. Data integrity and reliability; computer security. Prerequisite: Stat 130. (Spring)
- 149 **Simulation and Modeling** (3) Grier  
Discrete simulation of real-world systems. Simulation techniques and languages; queues; event-driven simulation systems. Analysis of algorithms; predicting system performance; queuing theory. Prerequisite: Stat 130; some statistics. (Spring)
- 150 **Senior Seminar** (3) Staff  
Advanced topics in computer science. Faculty present examples of current research work in computer science. Students work individually with a faculty advisor. Prerequisite: Senior standing or permission of department.
- 153-54 **Mathematical Models in Population Genetics** (3-3) Staff  
Basic elements of genetics and cell reproduction, deterministic models of gene



- frequency; and Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods. Staff
- 157-58 **Introduction to Mathematical Statistics** (3-3)  
Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: Math 31 and 32 or equivalent. (Academic year) Staff
- 160 **Mathematical Statistics for Economics Students** (3)  
Preparation for Stat 275. Prerequisite: Math 31 and 32 or equivalent. (Spring) Kirkendall
- 181 **Applied Time Series Analysis** (3)  
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157-58 or 118. (Fall) Grier, Toman
- 183 **Intermediate Statistical Laboratory: Statistical Computing Packages** (3)  
Application of program packages (e.g., SAS, SPSS, Biomed) to the solution of multivariate statistical problems. Basic concepts in data file preparation/manipulation, analytical techniques, and interpretation of results. Prerequisite: an introductory statistics course. (Fall and spring) Staff
- 187 **Introduction to Sampling** (3)  
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall) Staff
- 188 **Nonparametric Statistical Inference** (3)  
Statistical inference when the form of the underlying distribution is not fully specified. Nonparametric procedures for estimation and testing hypotheses. An introduction to robust procedures. Prerequisite: Stat 91 or equivalent. (Spring) Staff
- 189-90 **Mathematical Probability and Applications** (3-3)  
Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year) Staff
- 193 **Questionnaire Design** (3)  
Principles and procedures for developing effective questionnaires for mail, telephone, and personal interview surveys. Prerequisite: Stat 187 or equivalent, or permission of instructor. Staff
- 195 **Reading and Research in Statistics** (arr.)  
May be repeated once for credit. (Fall and spring) Thomas
- \*197 **Data Analysis Tools and the Personal Computer** (3)  
Study of support tools for data analysis and research. Topics in statistics, mathematics, computer programming, graphics, word processing, editing, text formatting, spread sheets, and data base. An individual project related to current research or work environment is required of each student. All work is done on a personal computer. This course satisfies the computer tool requirement. Prerequisite: Stat 118; or Math 32; or permission of instructor. Staff
- 198 **Special Topics** (3)  
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

### Third Group

- 201-2 **Mathematical Statistics** (3-3)  
Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: Math 33 and 124. (Academic year) Lilliefors

\* Credit will not be given for both Stat 129 and 197.



- 203 **Fundamental Algorithms and Their Analysis** (3) Mahmoud  
Basic tools for the study of algorithms, including asymptotic analysis and recurrence relations. Graphs and their representation in a computer. Some NP-complete graph problems. Open to qualified seniors. Prerequisite: Math 124; Math 113; Stat 131.
- 204 **Expert Systems** (3) Staff  
Advanced study of machine intelligence, with special emphasis on expert systems. Topics include advanced systems for problem solving and automated reasoning, reasoning in the presence of uncertainty, search control, backward and forward rule chaining, connectionist artificial intelligence. Prerequisite: Stat 147. (Spring)
- 206 **Multivariate Methods in the Behavioral Sciences** (3) Kirsch  
Application of multivariate analysis to data of the social sciences. Techniques covered include factor analysis, cluster analysis, discriminant analysis, and other topics. Prerequisite: Stat 105 or 118, and prior permission of the instructor. Not open to graduate students in statistics.
- 207 **Methods of Statistical Computing I** (3) Lilliefors  
Error analysis, computational aspects of linear models, sweep operator, random number generation, simulation, resampling. Optimization, numerical integration (Gaussian quadrature, Simpson's rule); E-M algorithm. Prerequisite: Stat 118, 129, 201-2; Math 124.
- 208 **Methods of Statistical Computing II** (3) Grier  
Generalized curve fitting, splines, spline smoothers; numerical linear algebra, including matrix decomposition and eigenvalue problems; optimization techniques, including maximum likelihood estimation; graphics for data display, including projections, convex hulls, point clouds, hidden line removal.
- 210 **Data Analysis** (3) Lachin, Thall  
A study of statistical methods for data analysis, using computerized statistical procedures. Multiple regression and the general linear model, discrimination and classification, the analysis of contingency tables, and nonparametric methods. Prerequisite: Stat 118 and either Stat 183 or 197 or demonstrated proficiency in computer programming. (Spring)
- 215-16 **Applied Multivariate Analysis** (3-3) Staff  
Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 119, 157-58, and Math 124. (Alternate academic years)
- 217-18 **Advanced ANOVA and Experimental Design** (3-3) Thall  
Advanced theory and application of general linear parametric model to experimental designs, estimation, and hypothesis testing. Prerequisite: Stat 157-58 or 201-2; Math 124. (Academic year)
- 221 **Design of Experiments for Behavioral Sciences** (3) Kirsch  
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in mathematical statistics. (Spring)
- 223 **Bayesian Inference** (3) Singpurwalla  
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201-2.
- 225-26 **Biostatistics** (3-3) Staff  
Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201-2. (Alternate academic years)
- 227 **Statistical Methods for Biomedical Research** (3) Lachin  
Statistical methods for the design and analysis of biomedical research studies, including the randomized clinical trial and other observational and epidemiologic studies. Evaluation of power and sample size, randomization, analysis of binary data, survival analysis, and regression. Prerequisite: Stat 201-2 or permission of instructor. (Fall)



- 231 **Contingency Table Analysis** (3)  
A study of the theoretical bases underlying the analysis of categorical data.  
Prerequisite: Stat 201-2 or 257-58. Staff
- 242 **Advanced Statistical Problems in Economic Analysis** (3)  
Applications of advanced theory to economic data. Gastwirth
- 257 **Probability** (3)  
Probabilistic foundations of statistics, probability distributions, random variables, moments, characteristic functions, modes of convergence, limit theorems, probability bounds. Prerequisite: Stat 201-2, knowledge of calculus through functions of several variables and series. (Fall) Smythe
- 258 **Distribution Theory** (3)  
Special distributions of statistics, small and large sample theory, order statistics, and spacings. Prerequisite: Stat 257. (Spring) Gastwirth
- 259-60 **Advanced Mathematical Probability** (3-3)  
Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: advanced calculus and permission of instructor. Staff
- 261 **Sequential Design and Analysis** (3)  
Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201-2. Staff
- 262 **Nonparametric Inference** (3)  
Inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 201-2. Staff
- 263 **Advanced Statistical Theory I** (3)  
Linear models, decision theoretic estimation, classical point estimation. Prerequisite: Stat 201-2. (Fall) Nayak
- 264 **Advanced Statistical Theory II** (3)  
Asymptotic theory, hypothesis testing, confidence regions. Prerequisite: Stat 201-2, 257. (Spring) Nayak, Smythe
- 265 **Multivariate Analysis** (3)  
Multivariate normal distribution. Hotelling's  $T^2$  and generalized  $T_0^2$ , Wishart distribution, discrimination and classification. Prerequisite: Stat 201-2 and Math 124. Nayak
- 266 **Topics in Multivariate Analysis** (3)  
Multivariate analysis of variance, principal components, canonical correlation, factor analysis. Prerequisite: Stat 265. Staff
- 273-74 **Stochastic Processes** (3-3)  
Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189-90, and 201-2 or 257-58. (Alternate academic years) Staff
- 275 **Econometrics I: Introduction** (3)  
Same as Econ 275. (Fall) Staff
- 276 **Econometrics II: Simultaneous Equations Models** (3)  
Same as Econ 276. (Fall) Staff
- 279 **Methods in Economic Statistics** (3)  
Application of statistical methods to economic data. Univariate and multiple regression and nonparametric techniques are used to analyze economic data. Measures of inequality, economic concentration, and forecast accuracy are discussed. Prerequisite: a one-year course in statistics. (Fall) Gastwirth
- 281 **Advanced Time Series Analysis** (3)  
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate and multivariate time series. Statespace or Kalman filter models, spectral analysis of multiple time series. Theory and applications using the University computer. Prerequisite: Math 33, Stat 201-2 or equivalent. (Spring) Kirkendall



- 282 **Time Series Analysis II: Statistical Inference** (3) Staff  
Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance. Prerequisite: Stat 281.
- 283 **Advanced Statistical Packages** (3) Grier  
Use of advanced computer systems to solve statistical problems. Extension of concepts of Stat 183, including macro programming, multivariate analysis, exploratory data analysis, interactive computer graphics, symbolic mathematics. Examples of possible packages include S, GLIM, SAS, MacSyma. Prerequisite: Stat 183 or 210 or permission of instructor.
- 287-88 **Modern Theory of Sample Surveys** (3-3) Staff  
Application of statistical theory to the sampling of finite populations. Simple, stratified, cluster, double and subsampling. Special topics, including superpopulations and randomized response. Prerequisite: Stat 91 and Math 32 or equivalent. (Academic year)
- 289 **Seminar** (3) Staff  
Admission by permission of instructor. (Fall and spring)
- 290 **Principles of Demography** (3) Staff  
Same as Econ 290.
- 291 **Methods of Demographic Analysis** (3) Staff  
Same as Econ 291.
- 295 **Reading and Research** (3) Staff  
May be repeated once for credit. (Fall or spring)
- 297 **Problems in Mathematical Statistics** (3) Staff
- 298 **Seminar: Special Topics** (3) Staff
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- Fourth Group**
- 378 **Seminar: Topics in Econometrics** (3) Staff  
Same as Econ 378.
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## TEACHER PREPARATION AND SPECIAL EDUCATION

Professors R.K. Ives, J.R. Shotel, M.S. Castleberry, R.N. Ianacone (Chair), G.L. Horrworth, C.D. Holden, A.J. Mazur  
Associate Professors N.J. Sobel, M.B. Freund, T.J. Rosegrant  
Assistant Professors J.M. Taymans, L.H. Cuenin, L.R. Putnam, S.S. Beck (Visiting), L.H. Mauro, N.B. Paley  
Director of the Reading Center F. Hesser

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Master of Education, and Doctor of Education.

## TEACHER EDUCATION

### First Group

- 9 **Techniques for Acquiring Meaning from College Texts** (0)  
The course is divided into three modules, which may be taken in sequence or individually. Acquisition, retention, and utilization of meaning. Analysis and synthesis of information into verbal and written discourse. Each student receives



an evaluation of his or her college-level reading ability. Placement testing is required, for which a \$10 fee is charged. Tuition is charged at the rate of 1 credit hour for each module.

- 50 **Introduction to Education and Human Services (3)**  
The scope of education and human services is defined from historical, philosophical, and cross-cultural perspectives. Field trips and group field experience. (Fall and spring)

### Second Group

TrEd 136, 137, 138, 139, 140, 142, 144, and 146 are special methods courses that are to be elected in the senior year by students in the Secondary Field of Study in secondary education after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104 and TrEd 105 for elementary majors; TrEd 131 for those in the Secondary Field of Study in secondary education.

- 105 **Social Issues in Education and Human Services (3)**  
Historical and social development of education and human services; evolution of American education related to the growth of the nation and the changing social order; examination of selected issues in contemporary education and human services. (Fall) Paley
- 110 **Elementary School Teaching of Reading (3)**  
Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and TrEd 105 or teaching experience. (Fall) Horowitz
- 111 **Elementary School Curriculum and Methods (3 to 15)**  
A comprehensive block course with subsections in mathematics, science, language arts, social studies, music, art, and physical education. Pre-student teaching three days a week. Prerequisite: Educ 104, 171, 172; TrEd 105; and senior standing. Material fee: \$10 per subsection. (Fall) Beck, Paley
- 118 **Elementary Reading: Classroom Diagnosis and Instruction (3)**  
Emphasis on the interconnections among teaching, learning, and diagnosis within the reading program. Prerequisite: TrEd 110 or equivalent. (Fall) Putnam
- 128 **Children's Literature (3)**  
Landmark works in the various genres of children's literature; strategies for integrating literature into the school curriculum. (Spring) Staff
- 131 **Secondary School Principles and Methods (3)**  
For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group work to be arranged. Prerequisite: Educ 104 and TrEd 105. Material fee, \$40. (Fall) Beck, Paley
- 132 **Student Teaching in Early Childhood Schools (3 or 6)**  
For seniors. Supervised teaching in selected prekindergarten or kindergarten class in accredited school; seminar. Admission by permission of instructor. Prerequisite: TrEd 111 or equivalent; TrEd 150, 152, 153, 154. (Fall and spring) Staff
- 134 **Student Teaching in Secondary Schools (6 to 9)**  
For seniors. Admission by permission of instructor. Prerequisite: TrEd 131. (Fall and spring) Beck, Paley
- 135 **Student Teaching in Elementary Schools (6 or 12)**  
Supervised teaching in an elementary school. Required seminar. Admission by permission of instructor. Prerequisite: TrEd 111 or equivalent. (Spring) Staff
- 136 **Teaching English in Secondary Schools (3)**  
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 18 semester hours in English. (Spring) Staff
- 138 **Teaching Social Studies in Secondary Schools (3)**  
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 24 semester hours of social studies. (Spring) Staff



- 139 **Teaching Art in Secondary Schools** (3) Staff  
Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of art.  
Material fee, \$5. (Spring)
- 140 **Teaching Mathematics in Secondary Schools** (3) Camerlengo  
Lecture (2 hours), fieldwork (2 hours). Prerequisite: mathematics through  
calculus. (Spring)
- 142 **Teaching Music in Secondary Schools** (3) Staff  
Prerequisite: 24 semester hours of music courses.
- 144 **Teaching Science in Secondary Schools** (3) Staff  
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 24 semester hours of  
science. (Spring)
- 146 **Teaching Foreign Languages** (3) Staff  
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 18 semester hours of one  
foreign language. (Spring)
- 150 **Foundations of Early Childhood Education** (3) Staff  
Historical development, philosophy, and objectives of nursery schools, kinder-  
gartens, and day care; exploration of contemporary programs and models with  
curriculum implications for schools in the United States and abroad. Admission  
by permission of instructor. (Fall)
- 152 **Early Childhood Curriculum** (3) Staff  
Rationale, development, content approaches, programs, and materials in lan-  
guage arts, mathematics, science, health, social studies, and aesthetic education.  
Admission by permission of instructor. (Fall)
- 153 **Role of the Professional in Early Childhood Education** (3) Staff  
Planning, reporting, records, teacher-child and teacher-family interaction, diag-  
nosis and evaluation, working with paraprofessionals and parents. Emphasis on  
total classroom ecology. Admission by permission of instructor. (Spring)
- 154 **Community Resources and Materials for the Young Child** (3) Staff  
Interaction with community agencies and resources for services; equipment,  
play activities, curriculum materials, and methods for teaching the infant and  
young child. Admission by permission of instructor. (Spring)
- 197-98 **Research and Independent Study** (3-3) Staff  
Individual or group study or research under the guidance of staff members.  
Program and conferences arranged with advisor. Admission by permission of  
advisor. (Academic year)

### Third Group

Department prerequisite: A degree from an accredited institution and adequate profes-  
sional preparation are prerequisite to all third-group courses in teacher education. Under-  
graduate students in their senior year may enroll in third-group courses with permission of  
the instructor.

- 205 **Foundations of Curriculum Development** (3) Staff  
For experienced teachers. Curriculum research and design, issues and trends,  
comparison of curriculum patterns, curriculum development in subject areas,  
and consideration of current field-related problems. (Fall)
- 216 **Recent Developments in Teaching Social Studies** (3) Staff  
For experienced educational personnel. Research, techniques, materials, and  
innovative programs relating to the effective teaching of social studies. Admis-  
sion by permission of instructor.
- 217 **Recent Developments in Teaching Science** (3) Staff  
For experienced educational personnel. Research, techniques, materials, and  
innovative programs relating to the effective teaching of science. Admission by  
permission of instructor.
- 218 **Recent Developments in Teaching Mathematics** (3) Staff  
For experienced educational personnel. Research, techniques, materials, and  
innovative programs relating to the effective teaching of mathematics. Admission  
by permission of instructor. (Spring)



- 220 **Selected Topics in Teacher Education** (arr.)  
Topics announced in the *Schedule of Classes*. Staff
- 221 **Developmental Reading: Emergent Literacy** (3)  
Focus on research into the literacy experiences and emergent reading and writing behaviors of young children in the first six years of life, along with implications for developing "literate environment" preschool and kindergarten classrooms. Putnam
- 222 **Foundations of Reading Development: K-Adult** (3)  
Basic theories and processes of reading acquisition and development; linguistic, cognitive, developmental, social, and affective bases of reading; varieties and influences of media and instructional strategies. Horrworth
- 223 **Reading Instruction in Content Areas: Elementary, Intermediate, and Secondary Schools** (3)  
Emphasis on basic group instructional methods and media; teaching demonstrations of basic reading and study skills in content subjects; study of readability of content materials; research and application of formulas. (Fall) Horrworth
- 224 **Diagnostic Teaching of Reading: K-6** (3)  
Classroom teaching and testing techniques for elementary teachers; administration, scoring, and interpretation of informal tests and other measures of evaluation; selecting and planning activities suitable for correction of specific problems. Prerequisite: at least one previous course in reading. (Spring) Johnson
- 225 **Measuring Mental Functions** (3)  
Administering, scoring, interpreting, and reporting the Wechsler Intelligence Scale for Children-Revised (WISC-R) and the Wechsler Intelligence Scale for Adults-Revised (WAIS-R). Material fee, \$25. (Fall and spring) Horrworth
- 226 **Diagnostic Teaching of Reading in Secondary School** (3)  
Application of instructional strategies and techniques presented in Educ 223 and 224. Construction of informal tests; administering, scoring, and interpreting informal and standardized tests; study and evaluation of materials; teaching strategies for on-grade students and for those with reading problems. Admission by permission of instructor. (Spring) Beck
- 227 **Current Issues in Elementary Education** (3)  
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall) Beck
- 228 **Instructional Areas in Elementary Education** (3)  
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education. (Spring) Staff
- 230 **Foundations of Early Childhood Education** (3)  
Historical developments; philosophy and objectives of nursery schools, kindergartens, and day care centers; exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. (Fall) Staff
- 231 **Community Resources and Materials for the Young Child** (3)  
Interaction with community agencies for service, resources, and equipment; physical facilities, play activities, curriculum materials, and methods for teaching the infant and young child. (Spring) Staff
- 232 **Early Childhood Curriculum** (3)  
Rationale, development, content, approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. (Fall) Staff
- 233 **Role of the Professional in Early Childhood Education** (3)  
Planning, reporting, maintaining records, teacher-child and teacher-family interaction, diagnosis and evaluations, working with paraprofessionals and parents. Emphasis on total classroom environment. (Spring) Staff
- 234 **Professional Internship in Secondary Education** (6)  
Staff
- 235 **Professional Internship in Elementary Education** (9)  
Staff
- 236 **Analysis of Teaching** (3)  
Teaching viewed as a system; component aspects are examined with a view toward developing a critical method of analysis. (Fall) Staff



- 237 **Practicum in Early Childhood Education** (3 to 6) Staff  
Supervised professional activity in selected early childhood programs; seminar.  
Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)
- 238 **Clinical Practicum in Reading** (3 to 6) Horrworth  
Supervised clinical experience, including observation and participation, in testing, tutoring, and teaching. Clients may include preschoolers through adults. Minimum of 120 clinic hours required. Admission by permission of instructor. Material fee, \$25.
- 241 **Education of the Gifted and Talented** (3) Rashid  
Nature and discovery of giftedness, provision for the gifted in educational settings. Research findings and issues. (Summer)
- 254 **The Middle School** (3) Staff  
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the pre-adolescent. (Fall)
- 273 **Pre-Service Teacher Education** (3) Staff  
(Formerly TrEd 373)  
Program development, governance, issues, trends. (Fall, alternate years)
- 274 **In-Service Planning and Programming** (3) Staff  
(Formerly TrEd 374)  
The continuing professional development of educators, with focus on the design, implementation, and evaluation of in-service training programs. (Summer)
- 287-88 **Clinical Study and Treatment of Reading Problems** (3-3) Putnam  
Testing and tutoring children and adults with reading problems. A case study approach is emphasized; participants are trained to administer a diagnostic battery of tests, evaluate results, and plan and implement tutoring strategies. Prerequisite: TrEd 222 and 224. Material fee, \$25. (Academic year)
- 289 **Organization and Administration of Reading Programs** (3) Horrworth  
For school administrators and reading teachers. Problems in planning, organizing, and monitoring the total reading program. (Spring)
- 290 **Severe Learning Disabilities in Reading** (3) Horrworth  
The course links the fields of learning disabilities and reading, focusing on their interconnections in terms of etiology, characteristics, diagnosis, and remediation. (Fall)
- 291 **Reading and Writing Across the Curriculum** (3) Putnam  
A whole-language approach to structuring classroom curriculum: strategies for developing students' reading and writing skills while studying literature, social studies, and science. (Fall and spring)
- 292 **Internship: Reading** (3 to 6) Horrworth  
Limited to graduate students in reading education. Experience in a selected area of teaching or supervisory service in field-based programs. Prerequisite: permission of instructor. (Fall and spring)
- 297-98 **Research and Independent Study** (3-3) Staff  
Individual research under the guidance of a staff member; program and conferences arranged with an instructor. (Academic year)
- Fourth Group**
- 308 **Instructional Processes in Teacher Preparation and Special Education** (3) Ives  
Review of instructional processes as they affect education and special education, including university and staff development perspectives; opportunities for practice in needs assessment, program design, and instruction. Admission by permission of instructor. (Spring)
- 321 **Practicum in Curriculum and Instruction** (3 to 6) Staff  
Supervised field experience in curriculum. Admission by permission of instructor. Prerequisite: TrEd 205. (Fall and spring)



- 324 **Teaching Reading and Study Skills at the College Level** (3) Staff  
Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: TrEd 226 or equivalent, and permission of instructor. (Spring)
- 325 **Curriculum Theory** (3) Staff  
Examination of reviews and research studies on curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. Prerequisite: TrEd 205. (Spring)
- 345 **Consultation Skills in Teacher Preparation and Special Education** (3) Ives, Shotel  
Consultation models from organizational development, organizational psychology, and mental health applied to in-service training for educational personnel and programs for the special student in the public schools. Material fee, \$25. (Spring and summer)
- 370 **Interpersonal Dynamics in Teacher Preparation** (3) Staff  
Attitude change and the access process. Applies specific psychosocial constructs germane to successful interaction to the milieu of the education consultant/administrator. Material fee, \$25. (Fall)
- 378 **Post-Master's Internship in Curriculum and Instruction** (3 to 6) Staff  
Supervised fieldwork for selected experienced teachers. (Fall and spring)
- 390 **Doctoral Seminar in Curriculum and Instruction** (3) Shotel  
Review of literature in a topical area; preparation of a manuscript of publishable quality. Admission by permission of instructor. (Fall)
- 391 **Dissertation Research** (arr.) Staff  
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: TrEd 390.

## SPECIAL EDUCATION

### First Group

- 57 **Curriculum Development for the Child With Special Needs** (3) Staff  
An overview of theory and scope of pre-academic and academic curriculum development as it relates to the special child. (Fall)
- 58 **Curriculum Adaptation for the Child With Special Needs** (3) Staff  
Lectures, demonstrations, and experiences designed to develop the student's ability to adapt curriculum and style of presentation to meet the needs of the special child. Prerequisite: SpEd 57. (Spring)

### Second Group

- 101 **Design and Implementation of the Special Education Classroom** (3) Mazur  
Instructional experiences designed to refine the insights and competencies essential for successful teaching in the special education classroom. (Fall)
- 102 **Practicum in Teaching the Child With Special Needs: Methods and Materials** (3 or 6) Mazur  
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. Material fee, \$50. (Fall)
- 103 **Practicum: Teaching the Child With Special Needs: Creative Programming** (3 or 6) Mazur  
Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. Material fee, \$50. (Spring)



- 160 **Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child** (3) Mazur  
An investigation of the assessment process: theory and scope of psycho-educational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations. Material fee, \$25.
- 168 **Overview of Handicapping Conditions: Etiology and Symptomatology** (3) Staff  
Causes and symptoms of most prevalent handicapping conditions in children who can be mainstreamed.
- 170 **Dynamics of Human Relations: Theory and Practice** (3) Mazur  
Discussion of psychosocial theory as it relates to successful interaction with children. (Fall)
- 189 **Preprofessional Internship: Program Adaptation for the Child With Special Needs in the Regular Classroom** (3) Mazur  
Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)
- 190 **Educational Intervention for the Child With Special Needs: Methods and Materials** (3) Staff  
Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with 103. (Spring)
- 197-98 **Research and Independent Study** (3-3) Staff  
Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)
- 199 **Practicum in Special Education** (6 to 12) Mazur  
Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Fall)
- Third Group**
- 201 **Overview of Special Education** (3) Staff  
Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children with special needs in a school program. (Fall)
- 220 **Selected Topics in Special Education** (arr.) Staff  
Courses on topics relevant to special educators offered to selected groups.
- 221 **Accessing Community Systems for the Special-Needs Individual** (3) Freund  
Overview of access to community systems and service delivery for individuals with special needs and their families. Material fee, \$25. (Spring and summer)
- 222 **Legislative Issues in Supportive Training, Transition, and Education Programs** (3) Ianacone  
Examination, interpretation, analysis, and monitoring of legislation and policies related to the handicapped. Emphasis on practical strategies for understanding and implementing federal and state legislation and policies. Material fee, \$25. (Fall)
- 229 **Interpretation and Application of Academic and Vocational Assessment Information** (3) Ianacone  
Specific strategies and techniques to analyze, interpret, and synthesize assessment information for the development of comprehensive academic/vocational profiles for handicapped adolescents and adults. Observation and recording procedures, report development, and postassessment conferencing are emphasized. Material fee, \$20.



**230 Vocational Assessment of Individuals Who Are Handicapped (3 to 6)**

Investigation of the vocational assessment process, including formal and informal systems to determine vocational interests, aptitudes, and employability. Material fee, \$25. (Spring) Ianacone

**231 Transitional Special Education Programming (3)**

Selected techniques and processes used in programming for the needs of handicapped individuals. Emphasis on the development of skills related to professional liaison and support roles in the design of instructional arrangements and cooperative training. Must be taken concurrently with SpEd 233. Material fee, \$20. (Fall) Taymans

**232 Dynamics of Career Intervention Techniques and Strategies for the Handicapped (3)**

Specific intervention techniques and strategies focusing on career and vocational decision making for handicapped individuals. Emphasis on combining theoretical constructs with practical field experience. Material fee, \$25. (Fall) Cuenin

**233 Curriculum in Transitional Special Education (3)**

Theory and practice in planning, implementing, and evaluating curriculum for handicapped adolescents and adults. Emphasis on techniques for modifying curriculum and materials for individualized programming. Requires field-site curriculum implementation. Usually taken concurrently with SpEd 231. (Fall) Taymans

**234 Seminar in Supportive Training, Transition, and Education (3)**

Analysis and development of professional presentations relating to supportive training, transition, and education. Material fee, \$20. (Spring) Staff

**235 Coordination of Job Placement Programs in Special Education (3)**

Rationale, resources, and programming strategies for the development and coordination of job placement programs for individuals who are handicapped. (Spring) Cuenin

**236 Introduction to Career/Vocational and Transitional Services (3)**

Introduction to programs that provide career, vocational, and transition services to handicapped adolescents and adults. Material fee, \$25. (Spring and summer) Staff

**237 Learning Strategies, Assessment, and Instruction for Learning Disabled Adolescents (3 to 6)**

Aspects of the provision of effective and appropriate educational services to learning disabled adolescents. Material fee, \$25. (Spring) Freund and Staff

**240 Developmental Process of Parenting (3)**

The developmental process of becoming a parent and ongoing parenting. Material fee, \$20. (Fall) Staff

**242 Neurodevelopmental Programming for Handicapped Infants and Toddlers (3 or 6)**

Provides students with a theoretical background and practical experience to translate the neurodevelopmental model into techniques for developing and implementing educational programs for handicapped infants and toddlers. Prerequisite: SpEd 263 or 268 or permission of instructor. Material fee, \$30. (Spring and summer) Freund

**243 Assessment of the Special-Needs Infant (3)**

Theory and current practice in the assessment of high-risk and handicapped infants. Material fee, \$30. Cuenin

**250 Specialized Techniques and Materials: Transitional Special Education (3)**

Specialized instructional techniques and resources in secondary, postsecondary, business, and community programming for individuals who are handicapped. Emphasis on collaborative planning and programming. Material fee, \$25. (Spring) Staff

**253 Special Education in Corrections: State of the Art (3)**

An introduction to the delivery of special education services within the juvenile



- justice and corrections systems. Presentations by theorists and practicing professionals. (Spring)
- 254 **Special Education in Corrections: Field Experiences** (3) Staff  
Site visits to local, state, and federal juvenile correction facilities and advocacy organizations, coordinated by a series of seminars tying theory to practice. Emphasis on program structure, goals, and general service delivery for handicapped individuals in correctional education. Material fee, \$20. (Summer)
- 255 **Interdisciplinary Case Management for Special Populations** (3) Staff  
Examination of programmatic implications of integrative academic, vocational, medical, and psychological service coordination and case management for special-needs populations. Emphasis on interdisciplinary team communication and coordination, decision making, planning, and follow-up for students and clients in secondary or adult settings. Material fee, \$25.
- 256 **Curriculum-Based Methods for Individuals Who Are Handicapped** (3) Staff  
Design, implementation, and modification of assessment and instructional methodology needed to develop individualized programming for individuals in school, transitional, and community settings. Material fee, \$25. (Fall)
- 260 **Developmental Assessment in Special Education** (3) Castleberry  
Development of assessment skills with academic diagnostic instruments. Study of validity, reliability, nonbiased testing, aptitude, achievement, and appropriate approaches. Material fee, \$40. (Fall)
- 261 **Practicum: Methods and Materials for Young Exceptional Children** (3 or 6) Staff  
Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Requires eight hours a week on site. (Fall and summer)
- 262 **Formal Assessment of Young Exceptional Children** (3) Castleberry  
Weekly seminar designed to prepare early childhood special educators to translate formal assessment data into instructional programming. Requires fieldwork with children. Material fee, \$25. (Fall)
- 263 **Development of the Infant with Special Needs** (3) Staff  
The processes of normal infant development and interrelationships among areas of development; relationship of these processes to the growth and development of the at-risk child. Material fee, \$25. (Summer)
- 264 **Educational Implications of Medical and Genetic Conditions of the Developmentally Delayed Child** (3) Freund  
Specialized programs, techniques, and methods for teaching developmentally delayed children, with emphasis on genetically linked handicapping conditions. Practitioner needs and programming concerns are stressed. Material fee, \$40. (Spring)
- 265 **Clinical Experience With Multiply Handicapped and Developmentally Disabled Young Children** (3) Ives, Freund  
Field experience and accompanying seminar for students with limited experience in early childhood special education. Intensive involvement in an early childhood special education setting. (Summer)
- 266 **The Development of Language from Birth to Five** (3) Rosegrant, Shotel  
The study of language acquisition (0-5) and the use of language programs. (Fall)
- 268 **Development of Young Exceptional Children: General Etiology of Handicapping Conditions** (3) Rosegrant, Freund  
An in-depth examination of the development of young exceptional children and the specific nature of handicapping conditions. Lecture and field visits. Material fee, \$25. (Fall)
- 269 **Etiology, Symptomatology, and Approaches to Intervention With Special-Needs Children** (3) Rosegrant  
Typical and atypical development of special-needs children. Etiology and symp-



- tomatology of handicapping conditions. Extensive field observations. Material fee, \$25. (Spring) Ives, Castleberry
- 270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum for Special-Needs Students** (3)  
Meeting the needs of the special-needs student in the regular classroom. (Spring, alternate years) Freund
- 271 **Interdisciplinary Approach to Planning for the Special-Needs Child** (3 or 6)  
Interdisciplinary team functioning and case management using a systems approach. Staff
- 273 **Pre-Service Planning and Programming** (3)  
(Formerly SpEd 373)  
Program development, governance, issues, trends. (Fall, alternate years) Staff
- 274 **In-Service Planning and Programming** (3)  
(Formerly SpEd 374)  
The continuing professional development of educators, with focus on the design, implementation, and evaluation of in-service training programs. (Summer) Mazur
- 275 **The Limited-English-Proficient Special-Needs Child: Policy, Research, and Trends** (3)  
Issues regarding educational service delivery for the LEP special-needs child. National, state, and local policies; current research in bilingual education, special education, and bilingual special education. Appropriate assessment techniques, accessing community resources, and characteristics and needs of language-minority students and their families. Material fee, \$25. Mazur
- 276 **Academic and Psychosocial Assessment of the Limited-English-Proficient Special-Needs Child** (3)  
Issues and implications of second-language learning; the relationship between learning disabilities and problems related to adaptation to a different culture. Students review and evaluate formal and nonformal assessment measures and administer bilingual assessment materials. Mazur
- 277 **Teaching the Limited-English-Proficient Student: Methods and Materials** (3)  
Students critique commonly used tests, learn formal and informal assessment strategies and prereferral interventions, and become familiar with curricular and classroom management strategies for use with bilingual students who are handicapped or have special needs. Instructional adaptations designed to meet cultural, linguistic, and academic needs in both mainstream and special classes. Mazur
- 278 **Internship: Educational Intervention for the Limited-English-Proficient Special-Needs Child** (3 to 6)  
Supervised internship. Students learn to write culturally relevant IEP programs, conduct effective parent interviews, and relate assessment findings to productive programming. Staff
- 280 **Developmental Assessment for Adolescents** (3)  
Formal and informal psychoeducational assessment; assessment instruments commonly used with upper-elementary and junior and senior high school students; the writing of psychoeducational reports. Material fee, \$25. (Spring) Ives
- 285 **Systems That Affect the Seriously Emotionally Disturbed Adolescent** (3)  
The various systems (home, school, interagency, community) that have an effect on the life of a seriously emotionally disturbed adolescent. Skills necessary to ensure that these systems function in the service of seriously emotionally disturbed adolescents. Sobel
- 287 **Interdisciplinary Topics Related to the Seriously Emotionally Disturbed Adolescent** (3)  
Examination of the multidisciplinary roles of the transition special educator of seriously emotionally disturbed adolescents. Goals of the transition process and issues and concerns relevant to the transition of emotionally disturbed adolescents from one level of service to another. (Spring)



- 288 **Psychoeducational Characteristics of the Seriously Emotionally Disturbed Adolescent** (3) Sobel  
An in-depth examination of relevant diagnostic categories, psychosocial development issues, and the nature and needs of the seriously disturbed adolescent. Material fee, \$25. (Fall)
- 289 **Curriculum Methods for the Seriously Emotionally Disturbed Adolescent** (3 to 6) Ives  
Design and implementation of appropriate educational and management plans. (Fall)
- 290 **Affective Development and Behavior Management in Special Education** (3) Castleberry  
Theory, programming, and behavior management strategies from theoretical and practical points of view. Material fee, \$25. (Spring)
- 291 **Behavior Management Practicum: The Seriously Emotionally Disturbed Adolescent** (3) Ives  
Examination of a comprehensive program and specific management strategies for classroom control. Material fee, \$25. (Summer)
- 292 **Professional Internship in the Education of Young Exceptional Children** (6 or 9) Castleberry  
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. (Spring and summer)
- 293 **Professional Internship for the Special Educator** (3 to 9) Freund, Castleberry  
Supervised internship in early intervention. (Spring and summer)
- 294 **Professional Internship: Service to the Seriously Emotionally Disturbed Adolescent** (6 to 9) Ives, Sobel  
Full-time placement as a psychoeducator in a residential or extended day-care site. (Spring)
- 295 **Professional Internship in Supportive Training, Transition, and Education Programs** (3 to 9) Ianacone  
Supervised internship focused on providing supportive training, transition, and education experiences for handicapped individuals. Emphasis on diversified cooperative and interagency programming efforts. 140-420 clock hours required. (Fall, spring, and summer)
- 296 **Philosophical, Legal, and Practical Issues of Service Delivery for the Special-Needs Child** (3) Shotel  
Historical and legal perspectives that have had an effect on service delivery systems for the special-needs child. Consequences of legislation on systems of service delivery in the public school. The impact on the regular classroom teacher and the administrator. (Summer)
- 297-98 **Research and Independent Study** (3-3) Staff  
Individual study or research under guidance of staff member. Program and conferences arranged with advisor. Admission by permission of advisor. May be repeated for credit. (Academic year)
- Fourth Group**
- 301 **Research Seminar in Special Education** (arr.) Staff  
Participation in a small group with a selected faculty member; research on and discussion of an area of common interest. Admission by permission of instructor. (Spring)
- 303 **Administration and Supervision of Special Education** (3) Ives, Castleberry  
Philosophy and nature of special education; program organization, administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor. Material fee, \$25. (Summer)
- 304 **Recent Research and Trends in Special Education** (3) Ianacone, Freund  
Emphasis on topical research issues and concerns, unique problems of conduct-



- ing research, and procedures and sources for obtaining research funding. Material fee, \$25. (Fall and spring) Ives, Freund
- 306 **Dynamics of Family Intervention: Theory and Practice in Special Education (3)**  
Theoretical foundations and clinical techniques necessary for the special educator to counsel parents of handicapped students. Material fee, \$25. (Spring) Ives
- 308 **Instructional Processes in Teacher Preparation and Special Education (3)**  
Review of instructional processes in education and special education; the effect of staff development and university programs. Opportunities for practice in needs assessment, program design, and instruction. Admission by permission of instructor. (Spring) Sobel
- 343 **Psychoeducational Diagnosis in Special Education (3)**  
The range of diagnostic strategies applicable to the student who presents psychosocial and related learning difficulties. Admission by permission of instructor. Material fee, \$25. (Spring) Ives, Sobel
- 345 **Consultation Skills in Teacher Preparation and Special Education (3)**  
Consultation models from organizational development, organizational psychology, and mental health applied to in-service training for educational personnel and programs for the special student in the public schools. Material fee, \$25. (Spring and summer) Sobel, Ives
- 351 **Developing Home/School/Community Support Systems (3)**  
Provides experiences that facilitate effective home/school/community support for the emotionally disturbed adolescent. Review of literature on dysfunctional family systems. (Spring) Staff
- 352 **Seminar: Legal Issues and Public Policy Concerns for Individuals Who Are Handicapped (3)**  
Identification and examination of policy issues; procedures involved in moving an area of concern into the political and legislative process; the role of agencies and advocacy groups in defining and shaping regulatory and implementation criteria into a legal mandate. Material fee, \$25. (Summer) Staff
- 353 **Post-Master's Internship in Special Education (3 to 6)**  
Supervised professional internship in college teaching, administration, supervision, research or policy-making. Internships are individually arranged. Admission by permission of instructor. (Fall and spring) Staff
- 354 **Doctoral Internship: Special Education (6)**  
Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship is individually arranged. Admission by permission of advisor. (Fall and spring) Rosegrant
- 360 **Interdisciplinary Techniques in the Diagnostic Process in Special Education (3)**  
Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent, and permission of instructor. Material fee, \$25. (Fall) Ives
- 370 **Interpersonal Dynamics in Special Education (3)**  
Attitude change and the access process. Applies specific psychosocial constructs germane to successful interaction to the milieu of the special education consultant/administrator. Material fee, \$25. (Fall) Sobel
- 390 **Doctoral Seminar in Special Education (3)**  
Review of literature in a topical area; preparation of a manuscript of publishable quality. Admission by permission of instructor. (Fall) Staff
- 391 **Dissertation Research (arr.)**



## TELECOMMUNICATION—GRADUATE PROGRAM

Professor C.H. Sterling (Director)  
Associate Professor T.J. Brennan

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Arts in the field of telecommunication. The program focuses on the interaction among technology, economics, management, and both corporate and governmental policy-making in the common carrier and media industries.

*Master of Arts in the field of telecommunication*—Prerequisite: a bachelor's degree with a B average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. Required courses for the degree include Econ 217 and 249; EE 450 and 451; TCom 201, 240, 241, 259; and four electives selected with a faculty advisor, typically drawn from TCom 220, 224; EE 452; AdSc 221; Mgt 282; and PAD 271, 272. Each student must pass a Master's Comprehensive Examination. A thesis option is available.

Telecommunications management is available as an elective field for the Master of Public Administration program in the School of Government and Business Administration; telecommunications and computers is available as an area of concentration within the Master of Science program in the School of Engineering and Applied Science.

- 201 **Development of the Telecommunication Industry** (3)  
Development of telecommunication technology, industry, and policy in the United States, stressing interrelationships among industry, government bodies and policies, and users.
- 220 **Technology and Telecommunication Policy** (3)  
National and international policy issues that arise from the interaction between scientific and technological development in the telecommunication industry and government policies. Prerequisite: TCom 201.
- 224 **Telecommunication Regulation** (3)  
Background, current status, and trends in regulation of common carriers and electronic media. Legislative, FCC, and judicial decisions and trends. Emphasis on the process of federal regulation, with case studies. Prerequisite: TCom 201.
- 240 **Seminar in Domestic Telecommunication Policy** (3)  
Interaction of private and public policy in telecommunication: research and development, market entry, competition, ownership and acquisition, regulation, business decisions, and social impact. The course is intended for degree candidates in their final year of study in the telecommunication program.
- 241 **Seminar in International Telecommunication Policy** (3)  
Role and process of U.S. and international telecommunication organizations; system authorization and utilization, transborder data flow and New World Information Order, barriers to trade in information equipment and services, regional facilities planning process, and development of competition. The course is intended for degree candidates in their final year of study in the telecommunication program.
- 259 **Applications of Economics in Telecommunication** (3)  
Structure, interrelationship, and function of the telecommunication industry within a changing regulatory framework. Prerequisite: Econ 249.
- 297 **Special Topics in Telecommunication** (3)  
Special topics in technology, economics, operations, or policy. May be repeated for credit once provided the topic differs. Prerequisite: TCom 201 and permission of instructor.
- 298 **Independent Study** (1 to 3)  
Prerequisite: permission of instructor.
- 299-300 **Thesis Research** (3-3)



The following courses are offered by the Department of Electrical Engineering in the School of Engineering and Applied Science for students in the telecommunication program:

**EE 450 Principles of Telecommunication (3)**

Essential elements of a telecommunication system, representation of signals in the frequency domain, the baseband frequency spectra, and bandwidths of voice, data, and video signals. Signal and noise power, distortion, and channel capacity.

**EE 451 Telecommunication Transmission Systems (3)**

Introduction to the use of microwave, fiber-optic, satellite, and computer communication systems. Sources and detectors for use in fiber-optic systems. Local area networks, packet-switched networks, routing algorithms, and performance. Prerequisite: EE 450 or permission of instructor.

**EE 452 Applications of Telecommunication Technologies (3)**

Advanced topics and recent technological developments in telecommunication, including traffic theory, queuing and switching systems, error detection and correction, ISDN, cellular radio systems, and security and privacy in communications. Prerequisite: EE 451 or permission of instructor.

## THEATRE AND DANCE

Professor M.R. Withers

Associate Professors N.D. Johnson (Chair), A.G. Wade, N.C. Garner, L.B. Jacobson

Assistant Professors B.W. Sabelli, W.A. Pucilowsky, C.F. Gudenius

Lecturer M.K. Grut

*Bachelor of Arts with a major in theatre (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—12 semester hours in dramatic literature.
3. Required courses in the major—TrDa 114, 130, 131, 136, 145–146, 147; 15 additional semester hours in second-group theatre and dance courses.

*Bachelor of Arts with a major in dance (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas: Mus 3–4.
3. Required courses in the major (placement in second-group technique courses is determined by audition): TrDa 130, 131, 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 180–81, 182–83, 184–85, 186–87, 190–91, 192, 193–94, 199. At the beginning of the senior year, all dance majors undertake a project in a special area of interest under the supervision of one or more faculty members.

*Minor in Theatre*—18 semester hours of theatre courses, including TrDa 145–146.

*Minors in Dance*—

1. *Dance and Dancing*: 6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 192, 193–94; 6 semester hours from TrDa 180–81, 182–83, 184–85; and 6 semester hours from TrDa 186–87, 190–91.
2. *Dance History and Criticism*: 6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 193–94; 12 semester hours from TrDa 46, 151, 152, 153, 190–91.
3. *Dance Education*: 6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 193–94; 6 semester hours from TrDa 180, 182 or 183, 184, 190 or 191; 6 semester hours from TrDa 154, 155, or 156.

*Master of Fine Arts in the field of theatre*—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.



Required: the general requirements stated under the Graduate School of Arts and Sciences.

For the concentration in theatre design, the program of study consists of 54 semester hours of second- and third-group course work in theatre and dance and in art, planned in consultation with the advisor, including a creative thesis (equivalent to 6 semester hours).

For the concentration in dance, the program of study consists of 36 semester hours of second- and third-group course work in theatre and dance and in related arts, planned in consultation with the advisor, including a creative thesis.

### First Group

First-group courses are primarily for nonmajors.

- |   |         |
|---|---------|
| 45 <b>Understanding the Theatre</b> (3)   | Sabelli |
| The art of the theatre; its literature, architecture, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer. Attendance at theatrical performances and presentations by visiting artists. (Fall and spring)                 |         |
| 46 <b>Understanding the Dance</b> (3)   | Johnson |
| Survey of multiple styles of dance and the relationship of dance to culture and society through the ages. Opportunities to experience dance forms through participation, viewing videotapes and films, and attending theatrical performances. (Fall and spring) |         |
| 50 <b>Beginning Ballet</b> (1)  | Staff   |
| 51 <b>Beginning/Intermediate Ballet</b> (1)   | Staff   |
| 52 <b>Beginning Modern Dance</b> (1)  | Staff   |
| 53 <b>Beginning/Intermediate Modern Dance</b> (1)   | Staff   |
| 54 <b>Beginning Jazz</b> (1)  | Staff   |
| 55 <b>Beginning/Intermediate Jazz</b> (1)   | Staff   |
| 56 <b>Beginning Tap</b> (1)   | Staff   |
| 57 <b>Beginning/Intermediate Tap</b> (1)  | Staff   |
| 58 <b>Beginning Spanish Dance</b> (1)   | Grut    |
| 59 <b>Beginning/Intermediate Spanish Dance</b> (1)  | Grut    |
| 60 <b>Beginning Dance: Ethnic Forms</b> (1)   | Staff   |
| 61 <b>Beginning/Intermediate Dance: Ethnic Forms</b> (1)  | Staff   |
| 62 <b>Beginning Ballroom Dance</b> (1)  | Staff   |
| 63 <b>Beginning/Intermediate Ballroom Dance</b> (1)   | Johnson |
| 64 <b>Beginning Folk Dance</b> (1)  | Staff   |
| 65 <b>Beginning/Intermediate Folk Dance</b> (1)   | Staff   |

### Second Group

- |   |                        |
|---|------------------------|
| 105 <b>Intermediate Playwriting I</b> (3)   | Claeysens              |
| Same as Engl 105.   |                        |
| 108 <b>Intermediate Playwriting II</b> (3)  | Claeysens              |
| Same as Engl 108.   |                        |
| 112 <b>Voice for the Theatre</b> (3)  | Jacobson               |
| The practice and application of voice production with reference to skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to performance. Prerequisite: SpHr 11 (for theatre majors) or permission of the instructor. (Fall) |                        |
| 113 <b>Special Problems in Speech for the Actor</b> (3)   | Jacobson               |
| Vocal production related to interpretation of specific texts. Focus on stage dialects and the interpretation of Shakespeare. Prerequisite: TrDa 112. (Spring)   |                        |
| 114 <b>Introduction to Acting</b> (3)   | Garner, Jacobson, Wade |
| Basic techniques of concentration, imagination, improvisation, and character analysis. (Fall and spring)  |                        |



- 115 **Beginning Scene Study** (3)  
Principles of role development, concentrating on 20th-century material. Prerequisite: TrDa 114. (Fall and spring) Garner, Jacobson
- 116 **Scene Study: Modern Comedy** (3)  
Principles of role development, comic timing, and stage business, concentrating on material by contemporary playwrights, such as Neil Simon. Prerequisite: TrDa 114. (Spring, odd years) Garner, Jacobson
- 117 **Audition Techniques** (3)  
All aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: TrDa 115 or equivalent. (Fall, even years) Jacobson, Garner
- 122 **Scene Study: Classical Drama** (3)  
Principles of role development and handling of verse dialogue, concentrating on classical Greek and Shakespearian drama. Prerequisite: TrDa 115. (Fall, odd years) Garner, Jacobson
- 123 **Scene Study: Classical Comedy** (3)  
Principles of role development, concentrating on material from the English Restoration, Molière, and other 17th- and 18th-century playwrights. Prerequisite: TrDa 115. (Spring, even years) Jacobson, Garner
- 130 **Theatre Production** (3)  
Theories and practicum in theatre and dance production, including acting or dance, stage management, costume and set construction, rigging, lighting, sound, makeup, business management, and publicity, with specific emphasis in at least one area. May be repeated once for credit. (Fall and spring) Gudenius
- 131 **Introduction to Lighting** (3)  
Lecture (2 hours), laboratory (1 hour). Theories and practicum in lighting for theatre and dance. Laboratory fee, \$15. (Fall) Gudenius
- 132 **Makeup Design** (3)  
Theory and practicum in the art of makeup design, including latex and crepe hair. Staff
- 133 **Stage Management** (1)  
Fundamental study of stage management with emphasis on practical production work as well as theory. Sabelli
- 134 **Theatre Architecture** (1)  
Study of general principles, theories, and styles of theatre architecture. Sabelli
- 135 **Introduction to Scene Design** (3)  
Fundamental study of scenography, including drafting, scene painting, rendering, stage properties, and model construction. (Fall, odd years) Pucilowsky
- 136 **Costume History and Construction** (3)  
History of fashion in Western civilization from ancient Greece to the 20th century. Fundamental study of costume research through specific projects. Costume construction. (Fall) Pucilowsky
- 140 **Anthropology, Drama, and the Human Experience** (3)  
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Same as Anth 191. (Spring) Garner, Allen
- 143 **Theatre in Washington** (3)  
An introduction to the artistic philosophies, organization, and operation of professional and semiprofessional theatres in Washington. Attendance at production is required. Lectures and discussions focus on performances and operations of the theatres. (Summer) Pucilowsky
- 145-46 **History of the Theatre** (3-3)  
An examination of the development and growth of the theatre from the beginnings to the present. TrDa 145: Greek through English Renaissance. TrDa 146: French Neoclassic to the early 20th century. (Academic year) Pucilowsky



- 147 **Directing for the Theatre** (3) Garner  
Fundamentals of script analysis, casting, and rehearsal techniques. Prerequisite: TrDa 114, 145, and 146. Laboratory fee, \$15. (Fall)
- 148 **Musical Theatre Production** (3 or 6) Pucilowsky and Staff  
Practicum on all components of a musical theatre production, including principles of design, aesthetics, theory, and historical overview. (Summer)
- 149 **Musical Theatre Performance** (3) Jacobson and Staff  
Intensive training and experience in the performance of musical theatre, culminating in a public performance. Practical staging application in movement, breathing techniques for singing, vocal production, and acting. (Summer)
- 151 **Ballet—The Illusive Art** (3) Johnson  
The art of ballet; its history, aesthetics, and performance. Contributions of the choreographer and performer are examined through lectures, class discussions, readings, and presentations by guest lecturers. Attendance at theatrical performances and videotape/film showings. Primarily for nonmajors. Prerequisite for nonmajors: TrDa 46.
- 152 **Dance in the 20th Century** (3) Withers  
Development of dance as an art form. Understanding the processes of creating dance. Improvisation, composition, choreography, and collaboration are examined. Participatory experiences. Primarily for nonmajors. Prerequisite for nonmajors: TrDa 46.
- 153 **Dance Aesthetics and Criticism** (3) Johnson  
Theories related to dance as an art form and their application to dance criticism. Viewing of videotapes and films and attendance at theatrical performances. Prerequisite for nonmajors: TrDa 46.
- 154 **Creative Dance for Children** (3) Withers  
Dance as an expressive art medium for children; concepts, principles, methods, and materials.
- 155 **Social and Recreational Forms of Dance** (3) Johnson  
The application of theories and teaching concepts to social and recreational forms of dance.
- 156 **Dance Pedagogy** (3) Johnson  
Philosophy, concepts, methods, materials, and organizational approaches to teaching dance in academic and nonacademic settings. Prerequisite: TrDa 186-87.
- 160-61 **Intermediate Ballet** (2-2)  
May be repeated for credit.
- 162-63 **Intermediate/Advanced Ballet** (2-2)  
May be repeated for credit.
- 164-65 **Advanced Ballet** (2-2)  
May be repeated for credit.
- 170-71 **Intermediate Modern Dance** (2-2)  
Admission by audition; may be repeated for credit.
- 172-73 **Intermediate/Advanced Modern Dance** (2-2)  
May be repeated for credit.
- 174-75 **Advanced Modern Dance** (2-2)  
May be repeated for credit.
- 180-81 **Movement Improvisation for Theatre and Dance** (3-3) Staff  
Awareness of body movement, environment, group dynamics, performances, and composition through improvisational techniques.
- 182-83 **Dance Composition** (3-3) Withers  
TrDa 182: Basic elements and principles of composition. TrDa 183: Advanced problems in composition. Prerequisite: TrDa 180-81 or equivalent. (Academic year)
- 184-85 **Choreography** (3-3) Withers  
The creation of a dance performance with reference to staging aspects. Prerequisite: TrDa 180-81, 192-93, or equivalent; TrDa 131 recommended. (Academic year)



- 186-87 **Body Alignment and Movement Theory** (3-3)  
Application of principles of anatomy, kinesiology, and physics to the analysis and practice of contemporary dance techniques. (Academic year) Withers Johnson
- 190-91 **Dance History** (3-3)  
History of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior. Prerequisite for nonmajors: TrDa 46. (Academic year) Johnson
- 192 **Repertory/Performance** (1)  
Participation in the processes of learning dance repertory and performing dance works. Audition required. May be repeated for credit. (Academic year) Staff
- 193-94 **Dance Styles** (arr.)  
Forms of theatrical dance other than ballet or modern. (Academic year) Staff
- 195 **Selected Topics** (3)  
Topics of current interest in theatre or dance. Topics announced in the Schedule of Classes. May be repeated for credit provided that the topic differs. Staff
- 196 **Independent Study** (1 to 6)  
Independent research and special projects. Open to seniors or exceptionally well-prepared juniors majoring in theatre or dance. Before students are permitted to register for TrDa 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and the department chair. Staff
- 198 **Internship** (3 or 6)  
Open to seniors majoring in theatre or dance. Work placements with not-for-profit and commercial theatre and dance organizations for an approved number of hours per week. Seminar meetings required. Admission requires departmental approval. May be taken for a maximum of 6 hours. (Fall and spring) Wade
- 199 **Senior Project** (3)  
Open to seniors majoring in theatre or dance. Before students are permitted to register for TrDa 199, they must submit a written proposal of the plan of study and obtain approval of the faculty member who will be directing the study and the department chair. Wade

### Third Group

Prerequisite to all third-group courses: M.F.A. candidacy or permission of instructor. Johnson

- 203 **Professional Literature** (3)  
Survey of the literature of the field, including print and media materials. Withers
- 207 **Trends in Contemporary Performance** (3)  
Study and discussion of current work in performance. Guest lectures and field study. Emphasis on individual projects. Gudenius
- 231 **Lighting Design** (3)  
Theory and execution of lighting design for theatre and dance. Prerequisite: TrDa 131. (Spring) Sabelli
- 234 **Advanced Scene Design** (3)  
Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretations. May be repeated once for credit. (Fall, even years) Sabelli
- 235 **Special Projects in Scene Design** (3)  
Exploration of all styles of traditional and contemporary scenography through the making of scale models. May be repeated once for credit. Admission by permission of instructor. (Spring) Pucilowsky
- 236 **Costume Design** (3)  
Introduction to the basic techniques of costume design through specific projects. Various rendering techniques will be explored, consistent with the historical period concerned. Prerequisite: TrDa 136. (Spring, odd years) Pucilowsky
- 237 **Advanced Costume Design** (3)  
Study of special design, style, and construction problems.



- 238 **Pattern Making** (3) Pucilowsky  
The study of pattern drafting and draping methods, based on contemporary and historical clothing, through lecture and class work. Prerequisite: TrDa 136. (Spring, even years)
- 250 **Advanced Dance Technique** (2) Staff  
Advanced study in selected styles: ballet, modern, Spanish. May be repeated for credit.
- 252 **Advanced Dance Composition** (3) Withers  
Elements of dance composition explored through improvisation, short movement studies, and dances that are presented, discussed, and reworked. May be repeated for credit.
- 255 **Choreographic Projects** (1 to 3) Withers  
Original dances are created or dances are reconstructed for performance under the guidance of dance faculty. May be repeated for credit.
- 260 **Special Studies in Dance Video** (3) Withers  
Review of existing art works of dance/video and dance/film for content and television production techniques. Emphasis on projects in-studio and with VHS and professional equipment. Lecture and laboratory.
- 270 **Aesthetics and Criticism** (3) Johnson  
Examination of aesthetic theories of dance as a performing art, with application to criticism.
- 290 **Workshop** (1 to 3) Staff  
Workshops with emphasis on contemporary issues and problems. Development of advanced professional competencies. Experts in short/intensive periods. May be repeated for credit.
- 291 **Internship** (3 or 6) Wade  
Internships with dance and theatre companies or arts organizations, including conference and/or seminar. May be taken for a total of 6 semester hours.
- 292 **Selected Topics in Theatre and Dance** (1 to 3) Staff  
May be repeated for credit.
- 294 **Independent Research in Theatre** (arr.) Staff  
May be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)

## TRAVEL AND TOURISM

See Human Kinetics and Leisure Studies.

## UNIVERSITY PROFESSORS

University Professors M. Cunliffe, A. Etzioni, P.J. Caws, S.H. Nasr

Courses numbered in the 770s are taught by distinguished scholars who hold appointments as University Professors. With the approval of the department or program concerned, appropriate University Professor courses may be taken to satisfy degree program requirements. Permission of the University Professor may be required for enrollment. A complete listing of courses offered each semester appears in the *Schedule of Classes* under the 700 series. Following is a list of courses that are expected to be taught fairly regularly by University Professors.

AmCv/Hist

- 771 **American Intellectual History: The Idea of Private Property** (3) Cunliffe  
American debates over private property, from the 17th century to the present day. Applications in legal, economic, political, and social thought and in imaginative literature. Entitlements and limits, land claims, slavery, women's property, copy-right, inheritances, the individual in relation to the community and the state.



AmCv/Engl/Hist

**772 American Intellectual History: The James Family (3)**

A consideration of one of America's most brilliant "clans," c. 1840–1920: Henry James, Sr., cosmopolite and Swedenborgian reformer, and three of his children—the novelist Henry James, Jr., the psychologist-philosopher William James, and their diarist-sister Alice James. Their writings will be examined in several contexts, including literary criticism, feminism, and psychohistory. Open to undergraduates and graduate students.

AmCv/Hist

**773 Republicanism in America (3)**

Republicanism as an ideology; historical antecedents in the Old World and the transit to North America; the repudiation of monarchy in 1776; the development and significance of republicanism in 19th-century America (with some comparative emphasis, especially on Latin America, France, and Britain); and the eventual loss of ideological vitality. For juniors and seniors; open to graduate students.

AmCv/Engl/Hist

**774 The History of Heroism (3)**

Interpretations of heroism, greatness, and genius since ancient times, with particular emphasis on 18th- to 20th-century conceptions. Hegelian, Marxist, and other theories of the role of the individual in affecting the course of history. The functions of biography, from hagiology to psychohistory, as a literary-historical genre. For juniors and seniors; open to graduate students.

AmCv/Engl

**775 The Great Popular Author in Britain and America, 1800–1915 (3)**

The emergence of imaginative writers (Scott, Thackeray, Dickens, Twain, Kipling) who were both highly and widely admired for combining entertainment and moral edification. Subsidiary attention to European "giants" (Hugo, George Sand). The sociology of 19th-century authorship: periodicals, publishers, reviewing, translation, copyright, platform appearances, fecundity, and versatility. Prerequisite: permission of the instructor. For graduate students; open to qualified undergraduates.

Phil

**776 Individualism (3)**

The concept of the free individual in philosophy, psychology, literature, and politics: individuals and groups; individualism and collectivism; exemplary individuals in biography, autobiography, and fiction; problems of individual and collective agency and identity. For undergraduates; open to graduate students.

Phil

**777 Understanding Technology (3)**

An examination of the idea of technology—its relations to the sciences and the arts and humanities, its development, and its problems. Technology will not be regarded as merely dependent on the sciences or as merely useful (or dangerous); it will be regarded as a human activity in its own right, with its own history, conceptual structure, interests, risks, and benefits. For undergraduates; open to graduate students.

Phil

**778 Left and Right in Philosophy and Politics (3)**

A fundamental inquiry, drawing on philosophy and the social sciences, into the concept of the state in terms of entrenched oppositions: individualism/collectivism, equality/liberty, liberalism/conservatism, socialism/free enterprise, communism/capitalism. Emphasis on the present need to find a constructive transcendence of these oppositions. Readings from Plato, Hobbes, Locke, Hegel, Marx, Freud, Levi-Strauss, Walzer, Nozick, and others. For undergraduates; open to graduate students.



Phil

779 **Philosophy and Psychoanalysis** (3)

Caws

An exploration of some striking parallels between the topics addressed by Freud's psychoanalytic theories on the one hand and the traditional content of philosophical reflection on the other, with special emphasis on the relation between cognitive theory and therapeutic practice (in both disciplines). For undergraduates; open to graduate students.

Rel

770 **Islamic Civilization and the West** (3)

Nasr

The encounter of Islam and the West, from the rise of Islam to modern times. Investigation of the impact of Islam on European philosophy, science, art, and literature; the impact of the image of Islam as shown in modern Western scholarship upon the Islamic world. For juniors and seniors; open to graduate students.

Rel

771 **Persian Sufi Literature in East and West** (3)

Nasr

The writings of major Persian Sufi poets and writers, such as Khayyam, Attar, Rumi, Shabistari, and Hafiz, and their impact in the West and in India. The translation of these works into European languages and their influence upon such figures as Goethe and Emerson are discussed. Assigned readings in English. For undergraduates; open to graduate students.

Rel

772 **Mysticism—East and West** (3)

Nasr

A thematic examination of major elements and components of mystical traditions, dealing with such issues as the nature of mysticism, the search for ultimate reality, the mystical significance of the cosmos, the mystical science of the soul, and the significance of sacred art and symbols. Major mystical traditions of East and West—Hinduism, Taoism, Buddhism, Judaism, Christianity, Islam.

Rel

773 **Perennial Philosophy** (3)

Nasr

The idea of perennial philosophy as developed in the 20th century by A. Huxley, A.C. Coomaraswamy, and certain Neo-Thomists. Doctrines and teachings of perennial philosophy as found in various religious and philosophical traditions of East and West. Prerequisite: at least one course in religion, philosophy, or intellectual history. For undergraduates; open to graduate students.

Rel

777 **Religion and Science** (3)

Nasr

The interaction between religion and science in different civilizations. This relationship in ancient Egypt, classical Greece, Islam, India, China, and the West, from the Renaissance, the scientific revolution, and up to the present day. Key concepts and issues in the encounter of religion and science are considered in light of the cultural matrix of the civilization and period in question. For juniors and seniors; open to graduate students.

Soc

776 **Public Policy Research** (3)

Etzioni

Basic concepts of policy research in comparison to basic and applied research. Policy research methods. The social structure of policy research: producers and consumers of knowledge and issues arising among them. Open to undergraduates and graduate students with permission of the instructor. Prerequisite: social science or public policy course work or related experience.

Soc/PSc

777 **Contemporary American Society** (3)

Etzioni

A social science perspective of American society and its main institutions and dynamics. Analysis of the concepts that allow continued insight into America's condition and its future. For undergraduates; open to graduate students.



Soc/Econ/PSc

**779 The Elements of Socioeconomics (3)**

A synthesized approach to the study of economic behavior and economic policy drawing on relevant segments of economics and sociology as well as political science and psychology. A discussion of ethical assumptions and core concepts in the study of micro- and macroeconomic behavior and their policy implications. For graduate students; open to qualified undergraduates.

**URBAN AND REGIONAL PLANNING**

Professors D.C. McGrath, Jr., S.S. Fuller (Chair), S. Greene, D.E. Gale  
 Adjunct Professors F. Gutheim, T.F. Carroll  
 Associate Professor R.W. Longstreth  
 Associate Professorial Lecturers J.L. Preston, R.D. Wagner, N. Longworth  
 Assistant Professorial Lecturer M.K. O'Bryon  
 Lecturer O.T. Carr, Jr. (Visiting)

See the School of Government and Business Administration for the program of study leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration and Doctor of Philosophy.

**First Group****50 Washington, D.C.:****History, Culture, and Politics (3)**

Same as AmCv/Hist/PSc 50.

Gillette and Interdisciplinary Team

**Second Group****153 Fundamentals of Urban Planning and Design (3)**

Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Spring)

**154 Survey of American Urban and Regional Planning (3)**

Examination of the historical roots, recent trends, issues, and new directions of American planning concepts, as well as the social and political forces that shape the character of planning in the United States. The roles of institutions, politicians, planners, and the general public in the planning process. Particular emphasis is placed on urban planning at the local governmental level. (Fall)

**175-176 American Architecture (3-3)**

Joint offering of the Urban and Regional Planning Department and the American Studies Program. Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form type characteristics, technological developments, and urbanistic patterns are introduced as a means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600-1860; U&RP/AmCv 176: 1860-present. Same as Art 176 and 191. (Academic year)

**177 Introduction to Historic Preservation (3)**

Washington, D.C., is the primary setting for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other locations will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subject to preservation efforts. Same as AmCv 177. (Spring)



## Third Group

- 201 **Planning Theory and Practice I** (3) Gale  
Introduction to the development of urbanization and urban settlements in the United States, the emergence and growth of urban and regional planning, and the evolution of issues in the practice of the planning profession. (Fall)
- 202 **Planning Theory and Practice II** (3) Gale  
Introduction to the concepts of planning, plan making, and plan implementation. Examination of the relationship between theory and practice in planning. Discussion of the role of reconnaissance studies, goal formulation, technological forecasting, and scenario development in planning practice. Prerequisite: U&RP 201 or permission of instructor. (Spring)
- 203 **Principles of Community Planning and Design** (4) Greene  
Planning and design studio to develop and apply planning methods and graphic techniques; principles of land use and community design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, \$20. Prerequisite: U&RP 201 or permission of instructor. (Fall)
- 207 **Land Development Planning** (3) McGrath  
Selected problems in urban and regional planning: applications of zoning, environmental controls, tax incentives, and other techniques available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)
- 208 **Land Use and Urban Transportation Planning** (3) McGrath  
Relationships between land use and the movement of goods and people. Examination of land use and transportation planning principles, issues, and techniques. Roles of public and private interests in land use and transportation planning and management. Prerequisite: U&RP 201 or permission of instructor. (Spring)
- 210 **Urban Development Economics** (3) Fuller  
Economic forces affecting urban growth and change; relationships among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217-18 or equivalent or permission of instructor. (Fall)
- 211 **Methods of Urban and Regional Analysis I** (3) Preston  
Study of basic statistical procedures and their interpretations, introduction to research methods and data collection and management, microcomputer operations and statistical problem solutions. This course establishes a computer capability that the student utilizes subsequently in all course assignments. (Fall)
- 212 **Methods of Urban and Regional Analysis II** (3) Fuller  
Introduction to methods used to analyze, estimate, and forecast population, employment, income, and economic growth and development. Includes cohort survival, location quotients, survey sampling and questionnaire design, shift-share, and case study methods. Prerequisite: U&RP 211. (Spring)
- 215 **Advanced Planning Problems** (4) McGrath  
Investigation of complex problems of the metropolitan region, analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, \$20. Prerequisite: U&RP 203 or permission of instructor. (Fall)
- 218 **Metropolitan and Regional Planning** (3) Fuller  
Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Prerequisite: U&RP 203 and 212 or permission of instructor. (Spring)
- 242 **International Urban Planning** (3) Carroll  
Examination and comparison of the theories of and approaches to urban planning in various countries. Analysis of the types of planning and development



- techniques employed and their effectiveness. Applicability of such approaches and methods within the context of the American urban planning process. Prerequisite: U&RP 201 or permission of instructor. (Spring) Gale
- 251 **Housing and Community Development: Concepts and Methods** (3) Gale  
An examination of the basic theories, concepts, principles, and analytical methods for managing the planning process by which cities approach the resolution of their development and housing needs. Housing supply and demand conditions, market analysis, physical inventory methods, community facility planning and impact analysis, commercial revitalization, and neighborhood theory and dynamics. Prerequisite: U&RP 201 or permission of instructor. (Fall)
- 252 **Housing and Community Development: Case Studies and Applications** (3)  
The application of theory and methodology to contemporary housing and community development issues. Examination of federal policies and programs, community facilities, redevelopment and adaptive reuse projects, and the role of the private sector. Case studies and field trips. Prerequisite: U&RP 251 or permission of instructor. (Spring) Fuller
- 255 **Urban Housing** (3)  
Principal issues affecting the demand for and supply of housing, including home financing, housing costs, tenure options, rehabilitation and conservation, market dynamics and requirements, and public-sector involvement. Prerequisite: U&RP 251 or permission of instructor. (Summer) Gale
- 256 **Neighborhood Dynamics** (3)  
Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer) Gale
- 257 **Fiscal Policy and Urban Planning** (3)  
Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall) Carr
- 258 **Advanced Urban Development Economics** (3)  
Analysis of case studies of large-scale development projects to gain comprehension of financial, political, legal, and technical complexities and constraints inherent in the urban development process. Prerequisite: U&RP 210 or permission of instructor. (Fall) Fuller
- 259 **Economic, Social, and Legal Aspects of Urban Development** (3) Fuller  
Same as BAd 225. Examination of the forces that shape urban development: introduction to market analysis methods and techniques to evaluate project feasibility; study of the institutional and legal framework within which urban development occurs and that influences controls, land value, and development potential; and analysis of roles and responsibilities of the public and private sector in the urban development process. (Fall) Greene
- 261 **Community Planning and Design: Concepts and Methods** (3) Greene  
Investigation of perceptual, social, physical, and aesthetic factors in planning and design. Emphasis on interaction of users and the environment, principles and process of community design, visual analysis, evaluation and implementation techniques. Prerequisite: U&RP 203 or permission of instructor. (Fall) Greene
- 262 **Community Planning and Design: Case Studies and Applications** (3)  
Planning and design studio; application of community design principles and process to typical problems of community change and development. Laboratory fee, \$20. Prerequisite: U&RP 261 or permission of instructor. (Spring) Greene
- 263 **Community Preservation and Design Studio** (3)  
Interdisciplinary studio class: application of the techniques and methods of historic preservation, urban planning, housing and community development.



- community design, and other disciplines to problems of revitalizing urban areas. Surveys, inventories, analyses, formulation of proposals, and presentation to faculty and cooperating groups. Laboratory fee, \$20. Prerequisite: U&RP 201 or permission of instructor. (Summer)
- 264 **Urban Development Planning and Design** (3) Greene  
Same as BAD 228. Application of planning/design principles and techniques in a studio/laboratory environment. Field reconnaissance and graphic techniques applied to projects in site selection, site analysis, concept formulation, and site planning in an urban context. Public and private sector issues are addressed in the preparation of a project development proposal. Prerequisite: BAD 225/U&RP 259 and BAD 226; must be taken concurrently with BAD 227. (Spring)
- 273 **Neighborhood Conservation** (3) Gale  
Examination of the economic, social, design, and public policy conditions that affect neighborhood decline and revitalization. Intensive analysis of financing mechanisms, implementation techniques, and planning tools useful in conserving and restoring older urban neighborhoods. Prerequisite: Permission of instructor. (Summer)
- 275 **The Politics of Historic Preservation** (3) Longworth  
Same as AmCv 275. Overview of the political issues, forces, events, and players that have shaped contemporary preservation practice, with an emphasis on public policy issues that have not been resolved and continue to confront preservation objectives. Prerequisite: Permission of instructor. (Spring)
- 276 **Economics of Preservation** (3) Wagner  
Same as AmCv 276. Analysis of economic techniques and benefits used to encourage the retention and reuse of historic buildings and districts in the United States. Prerequisite: Permission of instructor. (Spring)
- 277-78 **Historic Preservation: Principles and Methods** (3-3) Longstreth  
Joint offering of the Urban and Regional Planning Department and the American Studies Program. Same as Hist 277-78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)
- 290 **Special Topics in Urban and Regional Planning** (3) Staff  
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)
- 295 **Research Methods** (3) Staff  
Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)
- 298 **Directed Readings and Research in Urban and Regional Planning** (3) Staff
- 300 **Thesis Research** (3) Staff  
(Fall and spring)

#### Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

- 311 **Seminar: Public-Private Sector Institutions and Relationships** (3) Staff  
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidacy status.



**398 Advanced Reading and Research (arr.)**

Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring)

**399 Dissertation Research (arr.)**

Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

**WOMEN'S STUDIES—GRADUATE PROGRAMS**

Associate Professor P.M. Palmer (Director)

Adjunct Assistant Professor R. Spalter-Roth

Assistant Professorial Lecturer M.B. Pratt

**Committee on Women's Studies**

T. Brennan, J. Butler, M.M. Cassidy, J.O. Horton, P.H.M. Lengermann, P.M. Palmer, S. Ridder, A. Romines, R. Spalter-Roth

The Graduate School of Arts and Sciences offers two interdisciplinary programs leading to the degrees of Master of Arts in the field of women's studies and Master of Arts in the field of public policy with a concentration in women's studies. Both are directed by the Committee on Women's Studies and draw upon faculty from various departments within the University and resource persons in the community.

The women's studies programs seek to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women, and to provide training necessary to evaluate and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective degree candidates should consult with the director of the Women's Studies Program.

**Master of Arts in the field of women's studies and Master of Arts in the field of public policy with a concentration in women's studies**—Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work, with or without a thesis. All students must take a common core of women's studies courses: WStu 220, 221, 225, and a final 6 hours of either WStu 283 and 295 or WStu 299–300. Policy-oriented students must take four of the six courses in the public policy core (Stat 104, 183; PSc 203; Psyc 244; Econ 211, 217, 247), with Stat 104, 183, PSc 203, Psyc 244, and Econ 217 recommended; WStu 240 may be substituted for one of the core policy courses. Of the remaining three courses, two must be in the same discipline, which may be in the humanities, social sciences, or public administration. Those pursuing the Master of Arts in the field of women's studies must take, in addition to the core courses in women's studies, 12 semester hours in one other discipline (history, literature, economics, philosophy, or sociology) and 9 hours of electives. With permission, other disciplinary concentrations may be selected. All candidates are required to pass a Master's Comprehensive Examination.

**220 Perspectives on Women (3)**

Survey of the historical development of feminist theory in Europe and the United States from the 1790s to the 1930s, focusing especially on feminist responses to and critiques of basic assumptions of the developing social science disciplines. Topical focus on the application of theories to the explanation of sexuality, family, work, and political roles of women. (Fall)

**221 Research Issues in Women's Studies (3)**

Analysis of the contribution of feminist or gender-relations perspectives from the humanities and social science disciplines to the issues and methods of feminist research and social policy and practice. Topics include a review of feminist frameworks, a critique and re-evaluation of traditional academic disciplines, and analysis of current research on and for women, especially in the areas of race, sexuality, work, poverty, and social change. (Fall)



- 225 **Feminist Theory** (3) Staff  
Theoretical foundations of feminism in the United States. Theories and proposals for change currently espoused. Although focus is primarily on contemporary American feminism, some Third World and European thought will be considered. (Spring)
- 240 **Women and Public Policy** (3) Staff  
Gender analysis of U.S. government policies, such as equal employment opportunity, Social Security, and the federal budget. Basic steps in systematic policy analysis and how such analyses are affected by questions of gender distribution of power and money. (Spring)
- 241 **Women and the Law** (3) Ridder  
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Spring)
- 251 **Women, Literature, and the Arts** (3) Romines  
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Fall)
- 260 **Women in the American Work Force** (3) Palmer  
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and gender-based division of labor. Views of women's work in the home and outside it; interrelationships of women in and out of the work force; class, race, and ethnic differences. (Spring)
- 270 **Seminar: Selected Topics** (3) Staff  
Investigation of a current policy issue of particular concern to women, or consideration of women's status in a particular social system. (Fall and spring)
- 280 **Independent Study** (3) Staff  
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.
- 283-84 **Practicum in Women's Studies** (3) Staff  
Study of the changing status of women through supervised assignment to public and private agencies engaged in policy-making, education, political action, and research. Placement arrangements begin the semester prior to registration for this course.
- 295 **Independent Research in Women's Studies** (arr.) Staff  
Individual library or field research. Program advisor's approval of a written proposal required.
- 299-300 **Thesis Research** (3-3) Staff

The courses listed below, which emphasize the experience of women in the past and present, are available in Columbian College for undergraduate and graduate students:

AmCv/Hist 185	History of Women in America
Clas 170	Women in Classical Antiquity
Econ 141	Women in the Labor Market
Hist 125	Women in European History
Psyc 150	Psychology of Sex Differences
Rel 181	Women in Western Religion
Soc 155	Gender Roles and Socialization

#### YIDDISH

See Classics.

#### ZOOLOGY

See Biological Sciences.



## FACULTY AND STAFF OF INSTRUCTION 1988-1989

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

Elliott School of International Affairs

### EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*

B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Grover LaMarr Angel, *Professor Emeritus of Education*

B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Robert Edward Baker, *Professor Emeritus of Education*

B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

Ruth Lillian Aaronson Bari, *Professor Emeritus of Mathematics*

B.A. 1939, City University of New York, Brooklyn College; M.A. 1943, Ph.D. 1966, Johns Hopkins University

Lee Sheward Bielski, *Professor Emeritus of Speech Communication*

B.S. 1940, Ohio University; M.A. 1944, University of Michigan

Guy Black, *Professor Emeritus of Business Economics*

B.S. 1941, Harvard University; M.A. 1948, Ph.D. 1951, University of Chicago

Gretchen Rogers Bolwell, *Professor Emeritus of German*

B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Perry Botwin, *Professor Emeritus of Special Education*

B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Marcella Brenner, *Professor Emeritus of Education*

B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Harold Frederick Bright, *Professor Emeritus of Statistics; Vice President for Academic Affairs Emeritus*

B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas

David Springer Brown, *Professor Emeritus of Management*

B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Elizabeth Burtner, *Professor Emeritus of Physical Education*

B.A. 1927, Hood College; M.A. 1935, Columbia University

Willard Edmund Caldwell, *Professor Emeritus of Psychology*

B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Wesley Thomas Carroll, *Professor Emeritus of Education*

B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

James Harold Coberly, *Professor Emeritus of English*

B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Charles William Cole, *Professor Emeritus of English*

B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University



- Mary Ellen Coleman, *Professor Emeritus of Education*  
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University
- Roderic Hollett Davison, *Professor Emeritus of European History*  
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University
- William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*  
B.A. 1927, Ph.D. 1933, Yale University
- Roy Brandon Eastin, *Professor Emeritus of Business Administration*  
B.A. 1943, M.A. 1945, George Washington University; Ph.D. 1953, American University
- Julian Eisenstein, *Professor Emeritus of Physics*  
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University
- Lloyd Hartman Elliott, *Professor Emeritus of Higher Education; President Emeritus of the University*  
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; Ed.D. 1948, University of Colorado; LL.D. 1963, University of New Hampshire; LL.D. 1965, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1970, Husson College; LL.D. 1971, Georgetown University; Litt.D. 1986, West Virginia Institute of Technology; D.H.C. 1986, Kansai University, Japan; LL.D. 1988, American University
- Richard Ferdinand Ericson, *Professor Emeritus of Management*  
B.A. 1943, M.B.A. 1948, University of Chicago; Ph.D. 1952, Indiana University
- Lyndale Harpster George, *Associate Professor Emeritus of Human Kinetics and Leisure Studies*  
B.S. in PE. 1948, M.A. in Ed. 1952, A.P.C. 1961, George Washington University
- Samuel W. Greenhouse, *Professor Emeritus of Statistics*  
B.S. 1938, City University of New York, City College; M.A. 1954, Ph.D. 1959, George Washington University
- Andrew Gyorgy, *Professor Emeritus of International Affairs and Political Science*  
B.A. 1937, J.D. 1938, University of Budapest; M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles
- Ira Bowers Hansen, *Professor Emeritus of Zoology*  
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago
- Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*  
B.A. 1933, M.D. 1936, George Washington University
- Roy Hertz, *Research Professor Emeritus of Pharmacology*  
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University
- Henry William Herzog, *Vice President and Treasurer Emeritus*  
B.S. in C.E. 1930, LL.D. 1978, George Washington University
- Ching-Yao Hsieh, *Professor Emeritus of Economics*  
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University
- Thelma Hunt, *Professor Emeritus of Psychology*  
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University
- Joe Lee Jessup, *Professor Emeritus of Business Administration*  
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964, University of Chungang, Korea
- Eva Mayne Johnson, *Professor Emeritus of Psychology*  
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University
- Samuel Kavruck, *Professor Emeritus of Education*  
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1950, Ed.D. 1954, George Washington University
- John Whitefield Kendrick, *Professor Emeritus of Economics*  
B.A. 1937, M.A. 1939, University of North Carolina; Ph.D. 1955, George Washington University
- Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*  
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University
- Solomon Kullback, *Professor Emeritus of Statistics*  
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University
- John Francis Latimer, *Professor Emeritus of Classics*  
B.A. 1922, D.Litt. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University; D.H.L. 1987, George Washington University



- Thelma Z. Lavine, *Elton Professor Emeritus of Philosophy*  
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University
- Sar Levitan, *Professor Emeritus of Economics*  
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University
- Ralph Kepler Lewis, *Professor Emeritus of Anthropology*  
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph.D. 1967, Columbia University
- Calvin Darlington Linton, *Professor Emeritus of English; Dean Emeritus of Columbian College of Arts and Sciences*  
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins University
- William Allan MacDonald, *Professor Emeritus of Art and Archaeology*  
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University
- Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*  
B.B.A. 1950, M.B.A. 1951, University of Texas; Ph.D. 1959, Ohio State University
- Anthony Marinaccio, *Professor Emeritus of Education*  
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D. 1961, Parsons College
- Muriel Hope McClanahan, *Associate Professor Emeritus of English*  
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh
- Margaret McIntyre, *Professor Emeritus of Education*  
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University
- Florence Marie Mears, *Professor Emeritus of Mathematics*  
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University
- Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*  
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University
- Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*  
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg
- Frank Nelson Miller, Jr., *Professor Emeritus of Pathology*  
B.S. 1943, M.D. 1948, George Washington University
- Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*  
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University
- Charles Rudolph Naeser, *Professor Emeritus of Chemistry*  
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois
- David Nelson, *Professor Emeritus of Mathematics*  
B.A. 1939, M.A. 1940, Ph.D. 1946, University of Wisconsin
- Harry Robert Page, *Professor Emeritus of Business Administration*  
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University
- Kittie Fenley Parker, *Professor Emeritus of Botany*  
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona
- Thomas Martin Peery, *Professor Emeritus of Pathology*  
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina
- Ruth Irene Peterson, *Professor Emeritus of Education*  
B.S. 1945, State University of New York at Buffalo; M.S. 1946, Syracuse University; Ph.D. 1971, American University
- Vladimir Petrov, *Professor Emeritus of International Affairs*  
M.A. 1961, Ph.D. 1965, Yale University
- Ewing Lakin Phillips, *Professor Emeritus of Psychology*  
B.S. 1937, Central Missouri State College; M.A. 1940, University of Missouri; Ph.D. 1949, University of Minnesota
- John Palmer Reesing, Jr., *Professor Emeritus of English*  
B.A. 1941, Baylor University; M.A. 1942, Tulane University; Ph.D. 1954, Harvard University



- James Willis Robb, *Professor Emeritus of Romance Languages*  
B.A. 1939, Colgate University; M.A. 1950, Middlebury College; Ph.D. 1958, Catholic University of America
- Mary Louise Robbins, *Professor Emeritus of Microbiology*  
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University
- Daniel David Roman, *Professor Emeritus of Management Science*  
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California
- Blake Smith Root, *Professor Emeritus of Education*  
B.S. 1927, Monmouth College, Illinois; M.A. 1931, University of Illinois; Ed.D. 1948, George Washington University
- Robert Poindexter Sharkey, *Professor Emeritus of Economic History*  
B.A. 1948, Princeton University; Ph.D. 1958, Johns Hopkins University
- Benjamin Williams Smith, *Professor Emeritus of Biochemistry*  
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University
- Richard Saxon Snell, *Professor Emeritus of Anatomy and of Orthopaedic Surgery*  
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London
- Waldo Sommers, *Professor Emeritus of Public Administration*  
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University
- Loretta May Stallings, *Professor Emeritus of Human Kinetics and Leisure Studies*  
B.A. 1947, Stanford University; M.A. 1950, University of the Pacific; Ed.D. 1965, University of Texas
- George Steiner, *Professor Emeritus of Music*  
B.S. 1938, Mus.B. 1938, Mus.M. 1940, Johns Hopkins University
- Karl Ernest Stromsem, *Professor Emeritus of Public Administration*  
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley
- Choy-Tak Taam, *Professor Emeritus of Mathematics*  
B.S. 1942, University of Illinois; M.A. 1943, Ph.D. 1945, Harvard University
- Ira Rockwood Telford, *Professor Emeritus of Anatomy*  
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University
- Ronald Bettes Thompson, *Professor Emeritus of European History*  
B.A. 1935, Yale University; Ph.D. 1954, University of Chicago
- Rodney Tillman, *Professor Emeritus of Education*  
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University
- Kathryn Mildred Towne, *Professor Emeritus of Home Economics*  
B.S. 1923, Montana State University; M.A. 1930, Columbia University
- Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*  
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan
- William Lewis Turner, *Associate Professor Emeritus of English*  
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania
- Curtis Edward Tuthill, *Associate Professor Emeritus of Psychology*  
B.A. 1935, Macalester College; M.A. 1936, Ph.D. 1939, University of Iowa
- Robert Louis Weintraub, *Professor Emeritus of Botany*  
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University
- Edward Ronald Weismiller, *Professor Emeritus of English*  
B.A. 1938, Litt.D. 1953, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950, Oxford University
- Warren Reed West, *Professor Emeritus of Political Science*  
B.A. 1918, George Washington University; Ph.D. 1922, Johns Hopkins University
- Ralph Kirby White, *Professor Emeritus of Social Psychology*  
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University
- Marvin Milton Wofsey, *Professor Emeritus of Management*  
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University
- Helen Bates Yakobson, *Professor Emeritus of Russian*  
B.S. 1935, Harbin Law School, Manchuria
- Donnell Brooks Young, *Professor Emeritus of Zoology*  
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University



## ACTIVE\*

Fred Paul Abramson, *Professor of Pharmacology*

B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*

B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1965, University of California, Berkeley

Zoila F. Ortega Acevedo, *Assistant Professorial Lecturer in Health Services Administration*

B.A. 1970, City University of New York, Queens College; M.A. 1972, New York University; M.Phil. 1979, Syracuse University

Andrew Stanford Adams, *Professorial Lecturer in Administrative Sciences*

B.A. 1949, Ed.D. 1954, University of California, Berkeley

Arvil Van Adams, *Professor of Education Policy and of Economics*

B.A. 1965, M.B.A. 1966, Memphis State University; M.A. 1968, Ph.D. 1970, University of Kentucky

William Clayton Adams, *Professor of Public Administration*

B.A. 1971, M.A. 1972, Baylor University; Ph.D. 1977, George Washington University

K.C. Adiga, *Associate Research Professor of Chemistry*

B.S. 1970, Mysore University, India; M.S. 1975, Andhra University, India; Ph.D. 1980, Indian Institute of Science, India

Lewis Francis Affronti, *Professor of Microbiology*

B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Hugh Lecaine Agnew, *Assistant Professor of History and International Affairs*

B.A. 1975, Queen's University at Kingston, Canada; M.A. 1976, Ph.D. 1981, Stanford University

Yoshio Akiyama, *Professorial Lecturer in Mathematics*

M.A. 1963, Andrews University; Ph.D. 1967, University of Minnesota

Ali A. Alani, *Assistant Research Professor of Biological Sciences*

B.S. 1973, M.S. 1975, University of Baghdad, Iraq; M.S. 1979, Ph.D. 1985, University of Bordeaux, France

Ernest Narinder Albert, *Professor of Anatomy*

B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

John D. Albertson, *Adjunct Assistant Professor of Music*

B.M. 1981, Catholic University of America

Julia W. Albright, *Professor of Microbiology*

B.S. 1962, East Tennessee State University; M.S. 1972, University of Akron; Ph.D. 1978, Indiana State University

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*

B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*

B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Dean Conrad Allard, *Professorial Lecturer in History*

B.A. 1955, Dartmouth College; M.A. 1959, Georgetown University; Ph.D. 1967, George Washington University

Catherine Jean Allen, *Associate Professor of Anthropology*

B.A. 1969, St. John's College, Maryland; M.A. 1972, Ph.D. 1978, University of Illinois

John Paul Allen, *Professorial Lecturer in Administrative Sciences*

B.A. 1969, Saint Meinrad College; M.S. 1971, St. Louis University; M.P.A. 1974, University of Puget Sound; Ph.D. 1979, St. Louis University

Andrew Altman, *Associate Professor of Philosophy*

B.A. 1972, M.Phil. 1975, Ph.D. 1977, Columbia University

Marion Neustadt Ament, *Adjunct Assistant Professor of Spanish*

A.B. 1944, Bryn Mawr College; M.A. 1966, University of Maryland

\* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, and the membership of the several college and school faculties. Faculty titles listed here represent fall 1988 appointments.



- Frederick Amling, *Professor of Business Finance*  
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania
- Jeffrey Clifford Anderson, *Associate Professor of Art*  
B.A. 1970, University of Pittsburgh; M.F.A. 1973, Ph.D. 1976, Princeton University
- W. French Anderson, *Adjunct Professor of Genetics*  
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*Undergraduate and Graduate Programs* (covering all schools and divisions exclusive of the three listed below), Admissions Office  
*School of Engineering and Applied Science*, Admissions and Registration Office  
*School of Engineering and Applied Science*  
 National Law Center, Admissions Office, National Law Center  
*School of Medicine and Health Sciences*, Admissions Office, School of Medicine and Health Sciences  
*Schedule of Classes* (On Campus), Fall, Spring, and Summer, Registrar  
*Schedule of Classes* (Off Campus), Fall, Spring, and Summer, Division of Continuing Education  
*Summer Sessions Announcement*, Summer Sessions Office



## COLLEGES AND SCHOOLS—DEGREE PROGRAMS

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

School of Engineering and Applied Science: Bachelor of Science (Civil Engineering) (B.S.[C.E.]), Bachelor of Science (Computer Science) (B.S.[C.S.]), Bachelor of Science (Electrical Engineering) (B.S.[E.E.]), Bachelor of Science (Mechanical Engineering) (B.S.[M.E.]), Bachelor of Science (Systems Analysis and Engineering) (B.S.[S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

School of Education and Human Development: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

School of Government and Business Administration: Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), and Doctor of Philosophy (Ph.D.)

Elliott School of Public and International Affairs: Bachelor of Arts (B.A.) and Master of Arts (M.A.)



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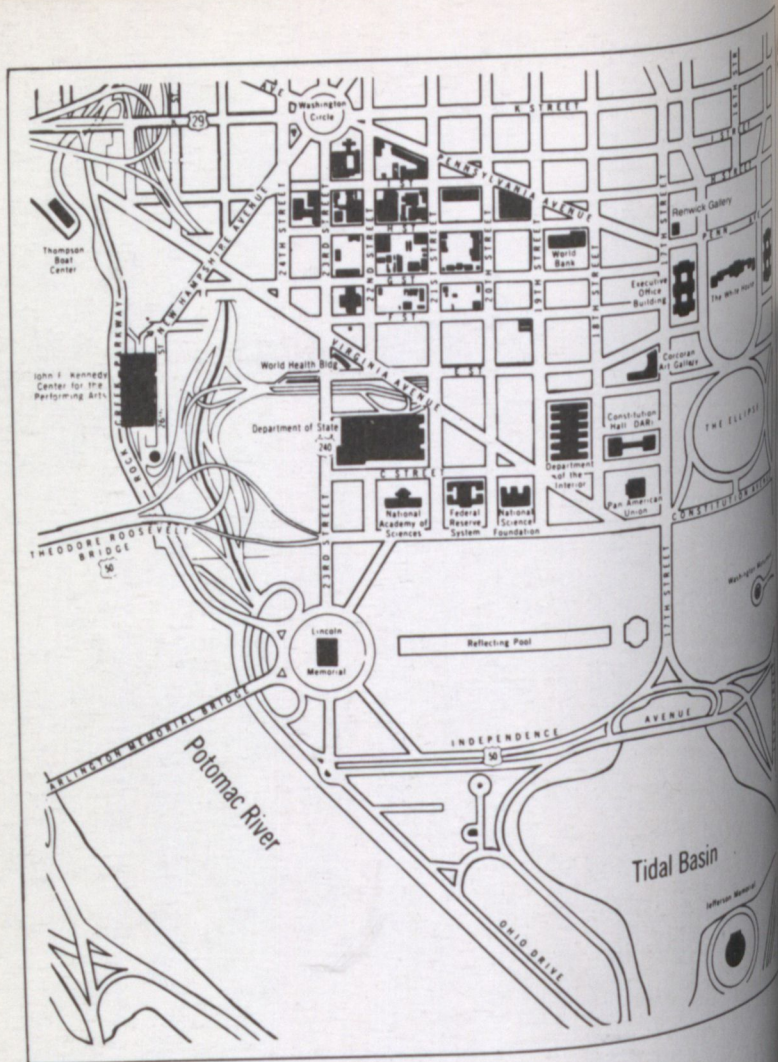


# The George Washington University

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School of Medicine and  
Health Sciences Bulletin  
1989-1990





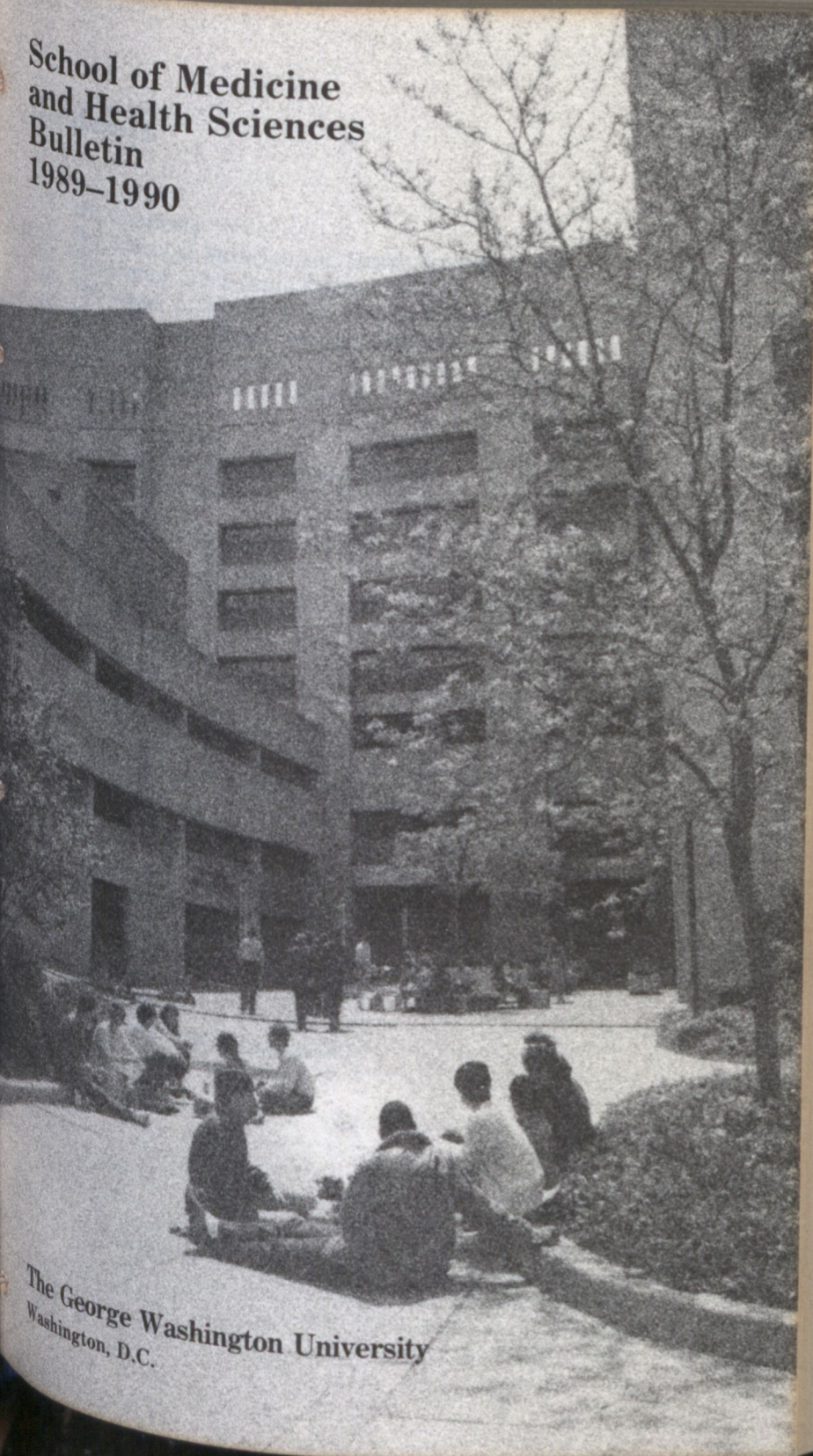
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August 1989

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**School of Medicine  
and Health Sciences  
Bulletin  
1989-1990**



**The George Washington University  
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# The University

## History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as president and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice and theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and one-half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the charter, lived at 2017 I Street. The first president of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and I Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.



The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center, the Elliott School of International Affairs, and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, and Government and Business Administration; and the Division of Continuing Education.

### Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. The University is on the approved list of the American Association of University Women and is a member of the College Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by its accrediting body, which is currently the Liaison Committee on Medical Education, sponsored jointly by the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

### University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Susan B. Kaplan, Special Assistant to the President, George Washington University, Washington, D.C. 20052, (202)994-6500, or to the Assistant Secretary for Civil Rights of the U.S. Department of Education.



## Board of Trustees of the University

The University is privately endowed and is governed by a Board of Trustees of which the president is an *ex officio* member.

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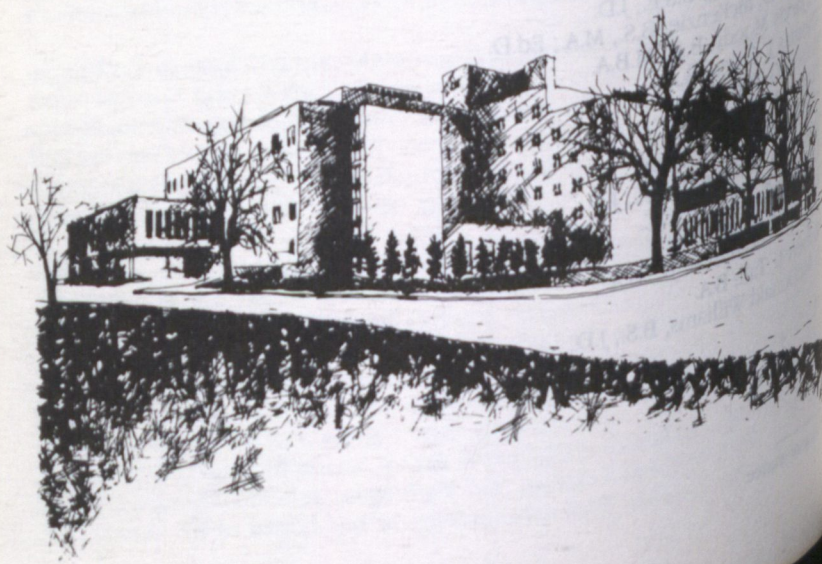


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# The School of Medicine and Health Sciences

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## Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; health sciences programs; educational evaluation; admissions; support services of the library and audiovisual facilities; and alumni affairs.

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## Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and the Medical Faculty Associates and for the supervision of graduate and continuing medical education programs, community affiliation programs, and the Medical Center public relations office.

John Charles LaRosa, M.D., *Dean for Clinical Affairs*  
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## Office of Research

The Office of Research is responsible for the development, administration, and support of the Medical Center research program, including laboratory research, sponsored projects, and clinical trials.

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Brian Lee Miller, B.S., *Director of Radiation Safety*

## History

The School of Medicine and Health Sciences of the George Washington University has a distinguished history that goes back more than a century and a half. In March 1825 the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement



of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences on which they have built careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus, one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels the academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates; and the Helen L. and Mary E. Warwick Memorial Building.

In 1973, with the introduction of undergraduate programs in health sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

## Regulations

Students enrolled in the University are required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which they are registered.

Students who withdraw or are suspended, or who, for any other reason, are not registered at the University for one semester or more, may reenter and continue work only under the regulations and requirements in force at the time of return.

If students knowingly make false statements or conceal material information on applications for admission, registration forms, or any other University documents, students' registrations may be canceled. If such falsification is discovered after students have matriculated at the University, students may be subject to dismissal from the University. Such students will be ineligible (except by special action of the faculty) for subsequent registration in the University.

## Registration

Attendance in class requires compliance with the School's registration deadlines.

## University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and



4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height, weight, and age of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

### **Right to Dismiss Students**

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University administration deems it advisable.

### **Right to Change Rules**

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

### **Right to Make Changes in Programs**

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

### **University Policy on Drugs**

The University cannot condone violations of law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

### **The Libraries**

Students have the privilege of using the University's Gelman Library and the Paul Himmelfarb Health Sciences Library. The stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

### **Property Responsibility**

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.



## Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1989 summer sessions and the academic year 1989-90.

### Tuition Fees

For M.D. candidates, for the academic year	\$22,500*
For M.P.H. candidates:	
Fall and spring semesters, per credit hour	408
Summer sessions, per credit hour	358†
For students in undergraduate health sciences programs	†

**Registration Fee** (charged all students)—\$25 per registration.

**Marvin Center Fee** (charged all students registered on campus)  
Per credit hour, to a maximum of \$112.50 per semester 10.75

**Additional Course Fees**—In certain courses additional fees, such as laboratory and material fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

**Computer Usage Fees** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is \$100 for any semester.

**Cost of Textbooks and Equipment for M.D. Candidates**—The average cost of textbooks and equipment (such as a microscope, drawing materials, glass slides, clinical thermometer, stethoscope, hemocytometer, and uniforms) is approximately as follows: first year, \$1,200; second year, \$1,000; third year, \$475; and fourth year, \$400. Microscopes must be provided by the student; rentals are not available from the School.

**Graduation Fee** (charged all students applying for graduation)—\$75.

### Special Fees and Deposits

Application fee (M.D. candidate), nonrefundable	\$45
Application fee (M.P.H. candidate), nonrefundable	45
Application fee (undergraduate degree or certificate candidate), nonrefundable	45
Advance tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	200
Admission tests (when required)	15

\* M.D. candidates who take courses offered by other divisions of the University during the summer sessions pay the summer sessions rate of \$358 per semester hour.  
† Tuition fees for undergraduate health sciences students vary by program and location. Please check with the Office of Health Sciences Programs Administration for specific rates.



Late-registration fee, for failure to register within the designated period:	
During first week of classes . . . . .	50
After first week of classes . . . . .	100
Late-payment fee (see Payment of Fees, below) . . . . .	15
Financial reinstatement fee, for reinstatement after financial encumbrance	
for nonpayment of fees (see Payment of Fees, below) . . . . .	35
Returned check fee, charged a student whose check is improperly	
drafted, incomplete, or returned by the bank for any reason . . . . .	15
Special Columbian College of Arts and Sciences departmental examination	
to qualify for receiving credit (advanced standing), waiver of	
requirement, or both . . . . .	50
Waiver examination to qualify for advanced placement . . . . .	20
English test for international students (when required) . . . . .	15
Laboratory check-out fee, for failure to check out of chemistry laboratory	
by the deadline date set by the instructor (a student who drops a	
chemistry course before the end of the semester must check	
out of the laboratory at the next laboratory period) . . . . .	10
Transcript fee . . . . .	2
Replacement of lost or stolen picture identification card . . . . .	5

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the use of the University libraries; (2) the services of the Career Services Center; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) the *Hatchet*, the student newspaper; (6) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

### Payment of Fees

**M.D. Program.** The annual tuition fee for the M.D. program is payable in two equal installments on or before registration day for each semester. M.D. students who register during the summer for courses offered in other divisions of the University are charged the regular summer tuition and other fees.

**Physician Assistant Program.** The annual tuition for the physician assistant program is payable in three equal installments on or before registration for each semester. The summer sessions portion of the program is considered a regular semester.

**All Other Programs.** Except for those programs listed above, tuition and fees will be assessed each semester on the basis of the program of studies for which the student registers.

**Payment Policies.** No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester, as described above, are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may elect to use deferred payment at the time of registration, permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 12 percent per annum on the unpaid balance will



be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government payment contracts, or other forms of tuition awards are not permitted to sign deferred tuition awards by \$2,000 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a \$15 late-payment fee and will be subject to the interest charge of 12 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of \$35. Accounts that must be referred to a collection service will be assessed all collection costs, including fees charged by the collection agency.

Students auditing courses are subject to all fees charged to students registered for credit.

Acceptance by the University of a student's fees does not in any way obligate the School of Medicine and Health Sciences to accept the student for any subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School, the Executive Committee of the Medical Center deems it advisable to do so.

**Returned Check Policy.** A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

**GWU Monthly Payment Plan.** The University's Monthly Payment Plan is available to all students. Upon receipt of the appropriate application, the University will establish an account and mail payment coupons and envelopes for use to ensure proper credit of payments. The plan covers an academic year (excluding summer sessions) and requires ten monthly payments, May through February. Payments must be received by the 10th of each month. If a decision is made after May to use this plan, all missed payments must be made to bring the account current to the time participation is initiated. There is no charge and no interest for using the plan if all payments are made as scheduled.

**Commercial Prepaid and Deferred Payment Plans.** Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899  
 Knight Insured Tuition Payment Plans, 53 Beacon Street, Boston, Mass. 02166  
 School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007  
 Educational Loan Program, Consumer Credit Department, Riggs National Bank  
 1120 Vermont Ave., N.W., Washington, D.C. 20005  
 The Tuition Plan, Inc., 57 Regional Drive, Concord, N.H. 03301



## Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice. Financial aid recipients must notify the Office of Student Financial Aid in writing.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters. No refund of the \$200 tuition deposit required of entering undergraduate students is granted.

### 1. Complete withdrawal from all courses

Withdrawal dated on or before Friday of the first week of classes . . . . .	80%
Withdrawal dated on or before Friday of the second week of classes . . . . .	60%
Withdrawal dated on or before Friday of the third week of classes . . . . .	40%
Withdrawal dated on or before Friday of the fourth week of classes . . . . .	25%
Withdrawal dated after the fourth week of classes . . . . .	None

*Partial withdrawal.* If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.

3. *Withdrawal from Year 3 of the M.D. program.* The School is aware that a student wishing to transfer to another university between the second and third years of the M.D. program may need to register for Year 3 at this School before receiving word of acceptance from the intended new program. Therefore, if a student has informed the School that he or she is attempting to transfer and learns that the transfer application has been successful only after registering for Year 3 at this University, the following refund schedule will apply:

Withdrawal dated on or before Friday of the fourth week of Year 3 classes . . . . .	100%
Withdrawal dated on or before Friday of the eighth week of Year 3 classes . . . . .	90%
Withdrawal dated after the eighth week of Year 3 classes . . . . .	None

4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

5. *Summer Sessions.* In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education. Federal regulations require that financial aid recipients use such refunds to repay financial aid received for that semester's attendance. This policy applies to institutional aid as well.

In no case will tuition be reduced or refunded because of absence from classes. Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.



## Student Life

The Office of the Vice President for Student and Academic Support Services establishes policy and procedures for those departments that affect student life, including Lisner Auditorium and the offices of Admissions, Student Financial Assistance, Campus Life, Safety and Security, Athletics and Recreation, and the Dean of Students (which includes Housing and Residence Life, the Student Health Service, the Counseling Center, the Career Services Center, International Services, Disabled Student Services, and the Educational Opportunity Program). More detailed information on these and other activities is contained in the *Student Handbook*.

### Student Health Service

The Student Health Service is an outpatient clinic staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits may be arranged by appointment or, during certain hours, secured on a walk-in basis. Many routine laboratory tests may be performed in the Health Service lab at cost. Allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the emergency room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs are not eligible. The bills incurred from all services rendered outside the Student Health Service (for example, X-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

*Health and Accident Insurance.* The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should consult the Student Health Service or the Office of the Dean of Students.

### Residence Halls and Food Service

The University's residence halls and food service are operated on the basis of the regular academic year (late August through early May). They are, therefore, not a useful option for most students in the School of Medicine and Health Sciences. Information on residence halls and food service is available from the office of Housing and Residence Life, Rice Hall, fourth floor, 2121 I Street, N.W.

### Cloyd Heck Marvin Center

The Marvin Center is the campus community center, offering programs, services, and facilities for students, faculty, staff, alumni, and University guests. It also provides facilities for programs conducted by the University Program Board, the academic departments that include the performing arts, and other University organizations.

The *Off-Campus Housing Resource Center*, located on the ground floor of the Marvin Center and open 24 hours a day, maintains a listing of apartments, rooms, and houses for rent in the Washington metropolitan area.



## Facilities

### Walter G. Ross Hall

Walter G. Ross Hall, opened in 1973, houses the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its total area is approximately 550,000 square feet, or more than 10 acres.

### Educational Support Services

A group of core facilities and services supports the educational, clinical, and research programs of the Medical Center. Coordinated by the associate dean for education, these services include the following.

*Office of Biomedical Communications (Frank D. Allan, Ph.D., Director).* This office provides consultation in the use of nonprint media and arranges for display of audiovisual materials and programs. Its production capabilities are available to students, faculty, and staff and include photography, illustration, a television studio, and photoduplicating services.

*Office of Academic Computer Services (Helmuth F. Orthner, Ph.D., Director).* This office offers computer assistance in such areas as educational testing, evaluation of student feedback, course registration, continuing medical education credit reporting, conference management, and automation of library procedures and inventories. The office also supports small databases for research projects that require interactive data maintenance or use forms that can be optically scanned, and it can transmit data to the University Computer Center for more sophisticated processing. The office also has facilities for word processing and serves as an interface for computer-assisted educational material from Massachusetts General Hospital and Ohio State University.

The facilities of the office include an on-line optical scanner (NCS 7001), a DEC PDP 11/60 minicomputer using the ANSI STANDARD MUMPS language environment, an on-line RJE 3780 communications link to the IBM 4381 in the University Computer Center, a Gandalf communications facility to connect terminals from various locations of the School via dedicated lines using high-speed modems, and several dial-up ports for the switched telephone network.

*Office of Education (Rhonda M. Goldberg, M.A., Director).* The Office of Education works with faculty and students to improve the educational environment. It conducts evaluations of courses and curricula and works toward the establishment of effective systems for evaluating student performance.

*Paul Himmelfarb Health Sciences Library (Shelley Bader, M.L.S., Director).* The library's collection includes more than 120,000 volumes and approximately 1,670 serials. The library also offers computerized on-line services that can access a number of bibliographic and information databases, including MEDLINE, produced by the National Library of Medicine (NLM). The Himmelfarb Library participates in NLM's Regional Medical Library Program, which facilitates interlibrary borrowing.

### The George Washington University Hospital

The George Washington University Hospital, adjacent to the School of Medicine and Health Sciences, is an acute-care facility with 501 adult and 39 pediatric beds. The hospital serves as the primary teaching site for students in the School of Medicine and Health Sciences and for more than 400 physicians participating in the 19 accredited postgraduate training programs offered by the Medical Center. The



hospital records approximately 20,000 patient admissions each year and provides a broad range of tertiary care services to an equally broad-based patient population.

The Medical Faculty Associates (MFA) is a private group practice of 200 full-time physicians who practice exclusively at the hospital and are dedicated to its mission of education and quality patient care. The MFA physicians make up the full-time clinical faculty of the Medical Center and represent all medical specialties, including the hospital-based specialties of radiology, pathology, anesthesiology, and emergency medicine. The MFA physicians receive approximately 150,000 patient office visits annually. The emergency medicine group staffs the hospital emergency unit—one of the busiest in the city—and contributes more than 50,000 visits per year. The MFA physicians' offices are consolidated in the 13-story H.B. Barnes Memorial Building, adjacent to the University Hospital.

The George Washington University Health Plan (GWUHP), a health maintenance organization, opened in 1972 to provide patient care and to provide students and house staff with educational experience in a prepaid health plan setting. The GWUHP has approximately 40,000 subscribers.

### The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility that is available to physicians for patient evaluation, the intensive care unit research project, and the radiation safety office.

### Affiliated Hospitals

*Children's Hospital National Medical Center.* Children's Hospital is the site for the School's Department of Pediatrics and offers a comprehensive clerkship experience for third-year students and a variety of elective opportunities in the fourth year. The hospital provides primary and tertiary care to children in the greater Washington area and is a referral center for children throughout the world.

*Fairfax Hospital.* This 656-bed voluntary community teaching hospital, part of a four-hospital system, serves a burgeoning suburban area and provides all clinical services, including psychiatry. Fairfax Hospital offers a rotating internship program, a school of medical technology, and clinical facilities for a school of practical nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in obstetrics and gynecology in the George Washington University Medical Center Program.

*Holy Cross Hospital.* Holy Cross, a 450-bed hospital, is a primary clinical campus that provides students with firsthand exposure to the practice of medicine in the community. It is a private, voluntary facility that provides a full range of medical, surgical, and pediatric services for a growing suburban population. The hospital has consistently had one of the highest occupancy rates in the metropolitan area.

*National Naval Medical Center.* The National Naval Medical Center, Bethesda, Maryland, is a 500-bed general hospital that offers a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active-duty and retired military personnel and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs internship, residency, and fellowship programs in twenty-five specialties.

*Saint Elizabeths Hospital.* Saint Elizabeths Hospital, formerly a federal psychiatric facility established by an 1852 Act of Congress, is now operated by the District



of Columbia. Medical students at George Washington University use the facilities of Saint Elizabeths for part of their clinical psychiatric training. A continuing research program is conducted at the hospital under a cooperative arrangement with the National Institute of Mental Health. The hospital maintains an up-to-date health sciences library.

**Veterans Administration Medical Center.** This 708-bed medical center has medicine, surgery, neurology, and psychiatry bed services. Other clinical services include radiology, nuclear medicine, laboratory (pathology), rehabilitation medicine, and radiation therapy. A 120-bed nursing home has recently been opened. At any time, 140 residents and nearly 100 medical students are receiving training at the VAMC under the supervision of 120 full-time staff physicians and a number of part-time staff physicians, consultants, and attending physicians. Specialized-care programs include drug and alcohol rehabilitation, open-heart surgery, radiation therapy, and an extensive dialysis program.

**Washington Hospital Center.** This 821-bed private, not-for-profit institution serves the greater Washington area through patient care, teaching, and research. A 74-bed intensive care tower supports the trauma and medical services, the cardiology and open-heart surgery programs, and the area's only adult burn service. The center offers approved postgraduate programs in all specialties except psychiatry and pediatrics for 205 residents and fellows. In addition, clinical rotations or teaching programs are provided for nurses, medical technologists, X-ray technicians, and other allied health professionals.

## Committees 1988-89

*Academic Freedom and Ethics*, G. Simon (Chair)  
*Admissions and Advanced Standing*, J. Williams (Chair)  
*Bylaws, Promotions, and Tenure*, J. Wiener (Chair)  
*Communications*, J. Zacharia (Chair)  
*Continuing Medical Education*, P. Kimmel (Chair)  
*Educational Evaluation*, R. Stillman (Chair)  
*Educational Planning*, J. Egan (Chair)  
*Graduate Medical Education*, S. Karmi (Chair)  
*Health Sciences Programs*, R. Shesser (Chair)  
*Public Relations*, M. Cassidy (Chair)  
*Student Affairs*, G. Stokes (Chair)  
*Research*, D. Wilkinson (Chair)

## Alumni Associations

### General Alumni Association

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University, who has left the University in good standing, and whose class has graduated is eligible for membership.

A Governing Board, composed of members representing the constituent alumni of the University's schools and colleges, directs the activities of the association. The



voluntary leadership of the association works closely with the staff of the Alumni Relations Office in carrying out association affairs. The association may be contacted through the Alumni Relations Office.

### Medical Alumni Association

The George Washington University Medical Alumni Association, established in 1959, continues the organization previously known as the George Washington University Medical Society. The purposes of the association are to provide constructive services for the M.D. degree alumni of the School of Medicine and Health Sciences and to promote the welfare of the School, its students, the George Washington University Hospital, and its trainees.

The membership of the association consists of all M.D. degree graduates of the School; current members and, on application, past members of the teaching staff of the School who hold doctoral degrees; and doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership is granted to all students in the M.D. degree program.

The Medical Alumni Association maintains an office in the School of Medicine and Health Sciences.

The following alumni and students served on the association council for 1988-89:

Stephen Pappas, M.D. 1956, *President*

Wayne D. Blackmon, M.D. 1978  
Mathew Budoff, class of 1990  
William H. Cooper, M.D. 1949  
Marvin Footer, M.D. 1942  
Karen Hughes, class of 1989  
Jack Kleh, M.D. 1944  
Sidney Levine, M.D. 1941

David R. Notes, M.D. 1966  
Alvin Parrish, M.D. 1945  
Julius S. Piver, M.D. 1952  
David H. Robb, M.D., 1958  
Elijah W. Titus, Jr., M.D. 1952  
John Umhau, M.D. 1952  
Allan Zellis, M.D. 1941







# The Doctor of Medicine Degree Program

## Admission

The George Washington University School of Medicine and Health Sciences seeks to admit intellectually gifted, empathetic, and mature students who have the capacity to excel in the science and art of medicine. Updated information on admission requirements, the application process, the program, and the curriculum is provided in a brochure available from the School's Office of Admissions. Applicants are encouraged to review this document carefully.

## Admission Requirements

To be considered for admission to the Doctor of Medicine (M.D.) degree program, applicants must have successfully completed a minimum of 90 semester hours at an accredited U.S. or Canadian institution of higher education. Professional school credit may be applied toward fulfillment of this minimum requirement only if the credit has already been accepted by the applicant's college or university toward a bachelor's degree. (Under the quarter system, a credit is two-thirds of a semester hour.) In most instances, applicants should complete four full years of undergraduate study; only exceptional applicants are accepted upon completion of the minimum requirements.

Exceptional students with three years of undergraduate work in George Washington University's Columbian College may be admitted to this medical school and receive a combined Bachelor of Arts-Doctor of Medicine degree (see page 25).

An early selection program enables George Washington University undergraduates to apply to the medical school at the end of the sophomore year. Those students accepted create a broad and vigorous program tailored to promote intellectual growth during their last two years in college. After graduation, they may enter the M.D. program. Applications and letters of evaluation are due in mid-May. Contact the Office of Admissions for more detailed information.

The following course work must be completed with satisfactory achievement before the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to ensure familiarity with the experimental methods and techniques of the disciplines.

**Biology**—eight semester hours, including two semester hours of laboratory, in general biology or zoology, but *not* in botany.

**Chemistry**—eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory, and six to eight semester hours of organic chemistry, including laboratory.

**Physics**—eight semester hours, including at least two semester hours of laboratory.

**English**—six semester hours in composition and literature, which may be the standard introductory college courses or their equivalents.

The number of required courses has been kept to a minimum to enable college students to pursue their own interests in depth. The admissions committee has no preference with regard to the applicant's major area of study. Applicants with majors in the arts, humanities, and social sciences are as admissible as applicants with science majors. The committee does expect, however, that work in the student's chosen area of concentration as well as in the required science courses will reflect scholarly interests and show evidence of significant achievement.



Applicants must submit scores on the Medical College Admission Test (MCAT). MCAT scores will be valid only if the test was taken within three years of the date of expected matriculation.

### Application Procedure

*For Admission to the First-Year Class.* The School participates in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 15 of the year preceding that for which admission is sought.

When it receives the AMCAS application, the Office of Admissions will send the applicant a supplemental application requesting information not included on the AMCAS application. The supplemental application must be returned with the nonrefundable supplemental application fee (\$45) no later than December 31. After these materials are reviewed, some applicants will be asked to submit letters of evaluation. The admissions committee will then invite the most promising candidates to come for personal interviews. Applicants will be informed of the committee's final decision as soon after the interviews as possible. Although it does not assume an obligation to report missing or erroneous credentials, the admissions office will try to contact the applicant if it is noted that necessary credentials are missing.

The School also participates in the AMCAS Early Decision Program. Interested applicants should read the AMCAS information booklet included with the AMCAS application materials. Early decision applicants should be aware that (1) they must submit their applications by August 1 of the year preceding that for which admission is sought, and (2) their supplemental applications and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on these applications are usually made by October 1 and no later than October 15.

Applicants should refer to the AMCAS information booklet and to the admissions brochure available from the School of Medicine and Health Sciences Office of Admissions for the most up-to-date information available at the time of application. Details included in those sources supersede information contained in this *Bulletin*.

All applicants are reminded that the submission of false or misleading information on application forms or in connection with the application process will be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it will be grounds for dismissal or for revocation of the degree.

*For Admission With Advanced Standing.* Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037.

Applications may be submitted for either the second or third year. Applicants for advanced standing must meet all requirements for admission to the first year of study in the School of Medicine and Health Sciences (see Admission Requirements). All applicants, except those currently enrolled in Doctor of Medicine degree programs at U.S. or Canadian schools, will be required to record scores on each subtest of the Medical Science Knowledge Profile.

All applicants must submit the advanced standing application and \$45 application fee by mid-May, three letters of recommendation, and Medical Science Knowledge Profile or National Board of Medical Examiners scores. If accepted, *official transcripts will be required.* The admissions committee will request an interview



with selected students. Detailed information and guidelines may be obtained from the Office of Admissions in January of the intended year of transfer.

### Selection Procedures

To process first-year applications fairly and expeditiously, the School uses an evaluation procedure that screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), MCAT scores, and pertinent extracurricular and work experience. Some additional consideration is given to applicants from the Washington metropolitan area and to applicants from George Washington University. There are no age limits.

Following this initial screening, approximately 60 percent of all applicants are asked to submit letters of evaluation. The admissions committee then invites about 1,000 applicants for personal interviews.

When all credentials and interview reports are available, the application is reviewed by the admissions committee. Although grades and MCAT scores are considered, the committee relies heavily on the essay portions of the applications, letters of evaluation, and interview reports in assessing those motivational and personal characteristics it feels are important in future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the place reserved. A substantial deposit is required in July and is credited toward the first semester's tuition.

### Program of Study

The curriculum leading to the Doctor of Medicine prepares students for professional lives of continuous learning. It is presumed that all graduates will seek additional training before assuming complete responsibility for independent clinical decision making.

In the first year, students concentrate primarily on basic sciences, including anatomy and biochemistry in the first semester and physiology, microbiology, and neurobiology in the second.

First- and second-year medical students may, at their discretion, register for electives in addition to the required program of study. The first two weeks of an elective are probationary, so that students may determine whether the elective is suited to their needs. Students may not drop an elective after this probationary period.

The second year integrates clinical information and basic sciences, particularly pathology and pharmacology. Medical students are introduced to physical diagnosis during the first semester of the second year. The course of study is coordinated by a program director, who works with faculty subcommittees and the second-year subcommittee on educational planning.

During the final two years, the program consists of required clerkships and elective sequences designed to prepare the student for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, health care sciences, anesthesiology, and emergency medicine. Each student must also complete an acting internship in medicine, pediatrics, or family medicine; a nonclinical (didactic) course; and a clinical course in neurosurgery or neurology. In addition, students choose from options in orthopaedics, urology, ophthalmology, pediatric surgery, and otolaryngology.

A variety of elective experiences are available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.



## Honors

Students will be graduated "with distinction" if they have received no failing or conditional grades during the four-year program leading to the Doctor of Medicine degree and either (1) have received Honors grades in at least 50 percent of the total credit hours earned in required courses during the first three years or (2) have received Honors grades in more than 45 percent of the total credit hours earned in required courses during the first three years and have been recommended by a faculty committee on the basis of a strong fourth-year performance.

## Joint Degree Programs

### Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 90 semester hours of prescribed college work (including a minimum of 30 hours in second-group courses in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student is eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

### Joint Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the joint degrees of Doctor of Medicine and Master of Science in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to pursue a joint degree program must meet the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chair of the department, the dean of the Graduate School of Arts and Sciences, and the dean of the Medical Center, for academic affairs.

The Master of Science program consists of a minimum of 30 semester hours of credit. A maximum of 12 semester hours of credit for graduate-level courses completed as a part of the Doctor of Medicine degree curriculum (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining 18 semester hours of work, which in most programs includes a thesis, must be work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

### Joint Doctor of Medicine and Doctor of Philosophy

In cooperation with the Graduate School of Arts and Sciences, a dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements that must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the joint degree program, a prospective student must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences. If admitted to both schools, the student may apply for affiliation with the joint degree program. Work toward the Ph.D. is performed



under the jurisdiction of a departmental doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. program toward the minimum of 48 hours of course work required to qualify for the General or Cumulative Examination for Ph.D. candidacy. This course work is normally taken during the semesters that alternate with the medical program and in the years following the award of the M.D. degree. The student's research for the dissertation may begin concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for completion of this joint program is six years.

Details of the requirements for the degrees of Master of Science and Doctor of Philosophy are included in the *Undergraduate and Graduate Programs Bulletin* of the University, available from the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

### Joint Doctor of Medicine and Master of Public Health

Students who wish to pursue the Master of Public Health in conjunction with the Doctor of Medicine must apply separately to each program. Those admitted must fulfill all requirements for each degree, although a limited amount of credit may be applied toward both degrees with the approval of the associate dean for student affairs. By taking M.P.H. courses during the summer and elective periods, medical students should be able to complete both degree programs in time to enter residency training on the usual schedule. For specific requirements of the M.P.H. program, see the description beginning on page 40.

## Regulations for M.D. Candidates

### A. General

1. Using the guidelines below, the Educational Planning Committee will periodically determine and report to the Faculty Senate on the appropriateness and number of credits for all courses.

#### First- and Second-Year Courses

- a. Lecture courses: one semester hour for each hour of lecture time per week per semester, adjusted as appropriate.
- b. Laboratory courses: one semester hour for each two or three hours of laboratory time per week per semester, adjusted if appropriate.

#### Third- and Fourth-Year Courses

- c. Clinical courses: five semester hours for each four weeks of clerkship; three semester hours for two-week clerkships.
2. The minimum academic requirement for the M.D. degree will be the completion of all courses designated by the Faculty Senate to be required and passing grade in all courses taken, whether required or not, other than electives in the first and second years.

### B. Evaluation of Academic Performance

1. Faculty are responsible for evaluating the performance of students in a meaningful, useful, and timely manner.



2. A pre-clinical evaluation form will be used in all first- and second-year courses. This form will be prepared in triplicate at the end of each course and distributed as follows: one copy to the dean for academic affairs, to be included in the student's file; one copy to the department; and one copy to the student.
3. A clinical evaluation form will be used in all third- and fourth-year courses. This form will be prepared in triplicate at the end of each clerkship or elective and distributed as follows: one copy to the dean for academic affairs, to be included in the student's file; one copy to the department; and one to the student. This form shall
  - a. list the attribute being evaluated;
  - b. provide for indication of the quality of performance; and
  - c. provide space for written comments, which are required.
4. Each department offering required courses should designate an evaluation coordinator to be in charge of student evaluation.

#### C. Grades

1. The authority for the assignment of grades rests primarily with academic departments or with interdisciplinary faculty. Exceptions are grades of Incomplete and Withdrawal (see below), which may be assigned only for reasons acceptable to the dean for academic affairs.
2. Departments are responsible for the assignment of grades on a rational, just, and unbiased basis.
3. The grading system for all non-required electives will be:

Pass (P)

Fail (F)

For all required courses and senior electives, the grading system will be:

Honors (H)

In Progress (IP)

Pass (P)

Incomplete (I)

Fail (F)

Withdrawal (W)

Conditional (CN)

Exempt (EX)

4. The following definitions apply:

*Honors (H)*

Those students whose performance in a subject is determined by the department concerned to be of superior quality and who, in addition, have demonstrated at the highest level those qualities of intellectual curiosity, motivation, and self-discipline that clearly set them apart from the majority of the group may be assigned the grade of Honors (H).

*Pass (P)*

All students, with the exception of those defined above, whose performance in a subject at least meets the requirements established by the department concerned shall be assigned a grade of Pass (P).

*Fail (F)*

Those students whose performance in a subject clearly falls so far below departmental passing standards that limited remedial work would be inadequate to correct the deficiencies shall be given a grade of Fail (F).

*Conditional (CN)*

Those students who do not meet the minimum requirements established by the department concerned but who could reasonably be expected to do so through a limited program of remedial work developed by the



department and approved by the Committee on Educational Evaluation shall be assigned the grade of Conditional (CN).

#### *In Progress (IP)*

The notation of IP will be assigned to students in courses that require more than one semester for completion. A grade will be assigned upon completion of the entire course in a subsequent semester.

#### *Incomplete (I)*

The notation of I will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the dean for academic affairs. Assignment of an Incomplete requires the prior approval of the dean for academic affairs or his/her designee on a case-by-case basis. A student in the first or second year may not proceed into the work of the following year until a grade of I has been removed; if not removed, a grade of I will be changed automatically to a grade of F after one year. A student in the third or fourth year must remove a grade of I prior to graduation.

#### *Withdrawal (W)*

The notation of W will be assigned only when a student is unable to continue in the course for reasons acceptable to the dean for academic affairs. Such reasons may *not* include scholarship.

#### *Exempt (EX)*

The notation of EX will be assigned when a student is excused by a department from taking a required course on the basis that s/he is already proven competent in the subject or when a student is given credit for passing an equivalent course in another institution.

5. All departments should submit F and CN grades to the office of the dean for academic affairs as soon as possible after the completion of a course or clerkship.

A grade of F requires that the student repeat the course or an equivalent remedial experience at this or some other institution approved by the department and the dean for academic affairs prior to proceeding to the work of the following year. Upon completion of the requisite course with a grade of Pass (P) or its equivalent, the student shall be permitted to continue in the M.D. program, and the grade of F will be converted to F/P if the passing grade was given by our faculty or F/EX if the course was taken at another institution. The grade of CN is not a passing grade and must be upgraded prior to the beginning of the next academic year or, in the case of clinical subjects, prior to graduation. Upon certification by the department that the student has attained suitable proficiency in the subject, the student shall be permitted to continue in the M.D. program and the grade of CN will be converted to CN/P. A student may, in lieu of such a program, elect to repeat the course at this or any other institution that is approved by the department concerned. A grade of Pass (P) or better shall then result in conversion of the CN to CN/EX.

6. Failure to upgrade a CN to CN/P or CN/EX by one of these procedures within the prescribed period shall result in automatic conversion of the CN to CN/F. As soon as possible after receipt of grades, the dean for academic affairs will inform the Committee on Educational Evaluation of the names of all students receiving grades of F or CN and submit their records to the committee for evaluation and recommendations.



7. The process defined below is designed to provide that protection against improper academic evaluation guaranteed by Section 2 B of the Statement of Student Rights and Responsibilities.

If a student feels an evaluation or grade to be unjust or inaccurate, s/he may, within five (5) days of receiving the grade, appeal to the signer of the evaluation for a hearing, simultaneously notifying the chairperson of the department. The signer of the evaluation must respond to the student quickly. Failure of the student to initiate such an appeal within five days indicates acceptance of the grade, unless an extension of the time limit is indicated for extenuating circumstances acceptable to the associate dean for student affairs. From this point on, the associate dean for student affairs will monitor the process to assure that it moves forward in a timely manner.

If a student remains dissatisfied, s/he should appeal in writing to the chairperson of the department or clinical division promptly for reconsideration of the evaluation. The chairperson shall conduct a review, consulting as appropriate with other faculty and staff, and inform the student in writing of the chairperson's determination at the earliest possible time. If the student remains dissatisfied, s/he may appeal in writing to the associate dean for student affairs. The associate dean or his/her designee will attempt to arbitrate by conferring with the student and authorities within the department.

Should that fail to resolve the complaint, the associate dean will establish an ad hoc committee to review the complaint. The committee will consist of four persons, at least one of whom will be a student, and none of the committee members will be from the department against which a complaint has been registered. The task of the committee will be to advise the associate dean for student affairs about (1) whether or not the evaluational or grading procedures used in that particular case were essentially the same as those used for other students in that course and (2) whether or not there is sufficient evidence of an unjust or erroneous evaluation to warrant referral of the case back to the department for reassessment of the student's competence. Acting upon the committee's advice, the associate dean will either accept the original grade and/or evaluation as valid or refer the case back to the department for reevaluation and/or grading of the student. The associate dean in cooperation with the department chairperson will determine an appropriate procedure for reevaluation and/or grading of the student. If the student or faculty member chooses to contest further the joint decision of the chairperson and associate dean, or if these two administrators are unable to reach agreement, the dean for academic affairs will review the situation and render a final decision on a reevaluation process. In every case, authority to evaluate and grade students resides in the academic department.

#### D. Academic Dismissal

1. The dean for academic affairs may dismiss a student for academic reasons on recommendation of the Committee on Educational Evaluation.

2. The Committee on Educational Evaluation will make its recommendations to the dean for academic affairs after careful review, considering the total number of credit hours of CN and F grades in courses and electives (except first- and second-year electives) attained by the student during the M.D. program. Conditional grades that have been remedied to CN/P and failing grades that have been remedied are calculated as conditional and failing grades, except in the case of a student who has been permitted to repeat a semester or a year. In such cases, the initial grades will not be counted for possible dismissal.



3. The following regulations establish the conditions under which academic dismissal may be recommended:

A student (a) who receives grades of F in required courses totalling 14 or more semester hours in any academic year, or (b) who receives grades of CN and F in required courses totalling more than 20 semester hours of work in any academic year, or (c) who receives grades of F in more than 20 semester hours of required work in the M.D. program, or (d) who receives grades of CN and F totalling more than 30 semester hours of required work in the M.D. program, or (e) who fails to meet any special requirements previously specified for that student by the dean for academic affairs as a condition for continuation in the program, or (f) whose knowledge, competencies, and personal characteristics have not been achieved, in the judgment of the Committee on Educational Evaluation and the dean for academic affairs, a satisfactory level of development and integration at any stage of training to justify continuing him/her as a reasonable candidate for the M.D. degree (see also Section F) will be subject to dismissal from the M.D. degree program.

#### E. Irregular Progress

1. Repetition of a Year

Upon the advice of the Committee on Educational Evaluation, the dean for academic affairs may *require* that a student in academic difficulty repeat a year or may *permit* a student at risk for dismissal to repeat a year. Requiring repetition of a year would be an option where there was a pattern of academic problems that would be difficult or impossible to remedy before the beginning of the next academic year. Allowing a student to recycle would be an option where the student was subject to dismissal on academic grounds but showed promise of mastering academic material on an additional attempt and of proceeding without further major difficulty toward becoming a competent physician.

A student eligible for promotion may be allowed to repeat a year at his/her own request.

2. Leaves of Absence

Leaves of absence may be granted at the discretion of the associate dean for student affairs.

3. Withdrawal from the M.D. Program

Withdrawal from the M.D. program is anticipated by the administration to be permanent. In the event that a student later changes his/her mind and wishes to re-enter the program, s/he must reapply through the Admissions Committee as any other candidate for medical school.

#### F. Evaluation of Professional Comportment

*This policy has been reviewed by the University Board of Trustees and established to accommodate the unique curriculum and degree requirements of the Medical Center. Unless the University Vice President for Academic Affairs decides in a particular case to have the case processed under the University Guide to Student Rights and Responsibilities, all cases involving misconduct by M.D. candidates will be processed under these regulations.*

Occasionally, by his/her behavior—or pattern of behaviors—a student may raise concern as to his/her suitability to continue in the study of medicine. It is impossible to catalogue all behaviors that might raise serious questions as to a student's competence to continue in medical school. A process that is described



below has been adopted by the Faculty Senate. It is intended to deal with behaviors that may be unacceptable or dangerous to the public if carried into the practice of medicine.

1. The following steps will be the process for identifying and dealing with students with serious problems relating to professional comportment:

- a. When a problem is perceived, the observer will communicate with the associate dean for student affairs. If the communication is verbal, it must be confirmed immediately by a signed letter that will be placed in the student's confidential file, which will be located in the academic dean's office. Access is restricted to the student under consideration, the dean for academic affairs, and the associate/assistant deans for student affairs and for education or their designees and, where appropriate, the Subcommittee on Professional Comportment of the Committee on Educational Evaluation. This file will be maintained until the student is awarded the M.D. degree, or until s/he withdraws, transfers, or is dismissed from the University for academic reasons. This file and its contents will be destroyed unless the Committee on Educational Evaluation has acted to make it part of the student's permanent record. In any case in which a student is dismissed from the University for nonacademic reasons, the contents of the file will be preserved permanently as a part of the student's record.

This process may be initiated by the Committee on Educational Evaluation when it is suspected that academic deficiencies are the result of psychological, medical, or behavioral problems.

- b. The associate dean for student affairs (or his/her designee) must meet with the student as soon as possible. Options for the associate dean would include (but not be limited to)

- (1) Advising the medical student but taking no further action.
- (2) Recommending that the student seek professional assistance for personal problems that may be impairing professional performance.
- (3) Developing additional information through contacts with the student, his or her peers, faculty, and/or professional consultants. For example, the associate dean may, with the student's concurrence, refer the student for medical or psychological evaluation. The charge for such an evaluation would be paid by the School of Medicine and Health Sciences, and the professional consultant would be requested to make a written report for inclusion in the student's confidential file.

- (4) Referring the case to the Subcommittee on Professional Comportment. This committee will consist of two students from the third or fourth year of the M.D. degree program and two full-time faculty, at least one of whom shall be a member of the Committee on Educational Evaluation. No administrative officer, including departmental chairpersons, course coordinators, and residency training program directors, will be eligible to serve on this subcommittee. Appointment will be for a term of one year. Tenure on the subcommittee will not exceed three years. The committee and its chairperson will be named by the chairperson of the Committee on Educational Evaluation. Students will be chosen from three third-year and three fourth-year students nominated by the Student Council, the others to be retained as possible alternates. All members of the subcommittee will have voting privileges and decisions will be made by majority



vote with all four members being present. Minutes of the subcommittee will be kept in the student's confidential file. The chairperson may keep duplicate records for the duration of the review, but these are to be returned to the dean's office at the end of the process.

c. If it is sent a case for review, the subcommittee will be responsible for gathering information from individuals who may include (but not be limited to) the student in question, his/her peers, faculty, the administration of the medical school, and, where deemed appropriate, professional consultants on medical or psychological aspects of the problem. While meetings of the subcommittee are confidential, the student in question and/or his/her counsel may attend information-gathering sessions as observers.

d. If the professional evaluation is requested by the subcommittee, referral will be made by the associate dean for student affairs or his/her designee. As described in Section 1 B (3) above, the cost of this evaluation would be borne by the School of Medicine and Health Sciences and a written report requested for inclusion in the student's confidential file. In contrast, a recommendation for the student to seek professional assistance would remain the concern of the student and not of the School of Medicine and Health Sciences. No contacts by the School will be made to that professional and the expense will be borne by the student.

e. The subcommittee will make a disposition regarding each case referred to it as soon as possible. Possible dispositions would include (but not be limited to) advising the student, referring the student for professional assistance for any medical or psychological problem at his/her expense, recommending modification in the student's academic program, and recommending temporary suspension or permanent dismissal from the M.D. program. Any recommendation for modification in the academic program requires that the case be reviewed by the parent committee. The student and, if s/he wishes, the student's counsel may be present during the presentation of information at such a review.

f. The subcommittee and/or the parent committee will submit recommendations to the dean for academic affairs or his/her designee.

2. Right of appeal will be as follows: The student will be informed of his/her right to request review by the next higher authority, i.e., the Subcommittee on Professional Comportment, the Committee on Educational Evaluation, the dean for academic affairs, and, finally, the vice president for medical affairs.

#### G. Academic Dishonesty

*This policy has been reviewed by the University Board of Trustees and established to accommodate the organizational and committee structure of the Medical Center. In cases of academic dishonesty involving M.D. candidates that may arise from within the Medical Center, this policy will be used instead of the University Policy on Academic Dishonesty adopted May 19, 1988.*

1. The Medical Center community, in order to fulfill its purpose, must assure integrity of behavior in the academic enterprise, establishing and maintaining guidelines as necessary to do so. All members of the community are expected to exhibit honesty in their academic work. Medical students are assumed to be familiar with commonly understood principles of academic honesty and with such examples of dishonest behavior as copying answers on examinations, using unauthorized aids to memory in examinations, etc.



giarizing, presenting papers that were purchased or otherwise acquired as of one's own authorship, and falsifying clinical or research data. They have a special responsibility to learn and observe any special procedures established within the Medical Center to assure integrity of academic behavior. Failure to act in accordance with such procedures will be considered academic dishonesty.

2. All members of the community—students, faculty, and staff—have a responsibility to prevent acts of academic dishonesty, or if they have occurred, to note and act upon them and to keep them from recurring.
3. Procedures

The remainder of this statement aims solely at informing members of the medical community of their rights and responsibilities with respect to academic dishonesty.

Reports of incidents of academic dishonesty that come to the attention of faculty members, Medical Center staff, or students are to be made by completion of the form entitled "Charge of Academic Dishonesty," after consultation with the departmental chairperson, course coordinator, or director of the service, as appropriate. This form, which identifies the student, describes the nature of the charge, and includes supporting evidence, should be forwarded to the dean for academic affairs and should remain confidential.

Upon receipt of the form, the dean for academic affairs will meet with the student to discuss the charge and supporting evidence and to present the student with a copy of the charge and with a copy of the "Regulations for M.D. Candidates."

If the accuser, the student, and the dean for academic affairs agree on the accuracy of the charges, the fact of this agreement shall be noted by the signatures of all three parties on the form and the case will be referred directly to the Committee on Educational Evaluation for recommendation of appropriate sanctions and modification of the academic program if necessary.

If the student or the dean believes the charge(s) not to be accurate, the case will be referred to the Committee on Educational Evaluation for review by the Subcommittee on Professional Comportment. The proceedings of the subcommittee and/or the parent committee shall be conducted as described in Section F 1 b (4) of these regulations.

#### 4. Sanctions

In addition to any other disposition available under Section F, one or more of the following sanctions must be invoked by the dean for academic affairs after considering the recommendation of the Committee on Educational Evaluation.

- a. Discarding the work product, which might result in an Incomplete, with the requirement that the student satisfactorily complete compensatory work or be reevaluated on relevant material.
- b. A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, to be expunged one year after imposition of the penalty, or upon graduation, whichever occurs first. Such a notation will not contribute to jeopardy for academic dismissal, but would require repetition of the course if the course is required.
- c. A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, with the notation appearing permanently on the record. Such a notation will not contribute to jeopardy for academic



dismissal, but would require repetition of the course if the course is required.

d. Expulsion of the student from the School of Medicine, with the notation of "Academic Dishonesty" placed on the permanent record.

#### 5. Safeguards During Procedure

Should the review and any appeal procedures not be completed before the date on which grades are submitted by the department, the grade of Incomplete will be recorded for the student in that course until the charges have been fully adjudicated. The student will not be prevented from meeting other academic requirements—such as taking Part I of the National Board examination or entering into the matching—prior to the imposition of sanctions and completion of all appeals that are to be undertaken. If the student voluntarily withdraws from the institution prior to completion of the review process, the following notation will be placed on his/her transcript: "Withdrew following accusation of academic dishonesty prior to completion of review and determination."

#### 6. Supplemental Guidelines

All departmental chairpersons and course and clerkship coordinators are responsible for informing faculty and staff members about the foregoing statement. Chairpersons are also responsible for publicizing to their students, faculty, and staff any supplemental departmental guidelines for academic honesty appropriate to their discipline.

### H. Policy on Promotions and Graduation—Academic Requirements

1. In general, promotion from one year to another—and recommendation to the Faculty Senate for award of the M.D. degree—will be automatic upon achievement of academic requirements. Under exceptional circumstances, when evaluation of personal comportment is pending or completed under procedures described in Section F, promotion or graduation may be postponed, denied, or subject to additional requirements set for individual students by the dean for academic affairs.

#### 2. Specific Requirements

a. Year I to Year II: Successful completion of all required work of the first year, with performance at least at the passing level (see Section A 2). The student may not begin the work of the second year until all deficiencies of the first year—that is, failing or conditional grades in required courses—have been satisfactorily remedied.

b. Year II to Year III: Successful completion of all required work of the second year, with performance at least at the passing level (see Section A 2). In addition, receipt in the dean's office of scores on Part I of the National Board of Medical Examiners examination and certification by the Department of Computer Medicine that the student has achieved basic competency in medical computing. (The computing requirement may be met at any time during the first or second year, but must be met prior to advancement into the third year.) The student may not proceed with the work of the third year until all deficiencies in work of the second year have been satisfactorily remedied.

c. Year III to Year IV: Successful completion of all required clerkships of the third year, with performance at least at the passing level. A student may be permitted to matriculate in the fourth year despite unremedied deficiencies in the third-year performance if those deficiencies are to be



remedied prior to graduation during time that would otherwise be available to the student as elective time or vacation.

- d. Eligibility for Graduation: Students will be recommended to the Faculty Senate to be awarded the M.D. degree upon completion of the minimum academic requirements described in Section A 2 (completion of all courses designated by the Faculty Senate to be required and a passing grade in all courses taken, whether required or not, other than electives in the first and second years) and fulfillment of any additional conditions relating to personal comportment imposed by the dean for academic affairs (see Section F).

#### I. Application for Graduation

Application and fee for graduation must be filed in the office of the dean for academic affairs at the time of registration for the last semester of the fourth year.

#### J. Presence at Graduation

A candidate is required to be present at the graduation exercise unless written application for graduation *in absentia* is approved by the dean for academic affairs.

### Financial Aid

All policies regarding student eligibility for financial assistance from institutional and government sources are stated in the *Financial Aid Memo*, published annually by the School. Assistance is awarded primarily on the basis of demonstrated financial need. In addition, recipients must be enrolled, in regular attendance, and making satisfactory academic progress in accordance with the Regulations for M.D. Candidates.

The *Financial Aid Memo* and application materials are available from the Financial Aid Office of the Medical Center, Ross Hall, Room 713, 2300 I Street, N.W., Washington, D.C. 20037. Students who wish to be considered for the loans and scholarships listed below must complete an application for financial assistance each year. The deadline for submission of financial aid applications is April 15, unless otherwise noted.

#### Satisfactory Academic Progress

The academic requirements of the M.D. program are rigorous, and the progress of each student is carefully monitored. Students are not allowed to continue their course work at the School if they are not considered by the faculty to be capable of attaining the M.D. degree. Therefore, matriculated students who have not withdrawn or been dismissed are considered to be in good standing and making satisfactory academic progress.

As a rule, the M.D. program is completed in four years of full-time study. In some instances, however, the student may be required or permitted to repeat a year (see Irregular Progress, page 30). Students making irregular progress are nonetheless considered to be making satisfactory academic progress, even though the time taken to complete the degree may exceed four years. The specific standards of progress used in determining eligibility for financial aid are as follows:

1. Students who successfully complete required course work within the academic year and move on to the next year's set of requirements meet the satisfactory academic progress criterion for financial aid eligibility and have four consecutive academic years in which they may be eligible to receive financial aid. Students who



are having academic difficulty but are able to complete necessary remediation before the beginning of the next academic year are also eligible to receive financial aid for four consecutive academic years.

2. Students may require additional time to complete course work due to academic or personal difficulties. In such situations, the Committee on Educational Evaluation and the associate dean for student affairs may establish a schedule for the student that departs from the norm and may require repeating a year of study. For such students, the maximum time frame for financial aid eligibility shall be seven (not necessarily consecutive) years.

3. Any period of time spent on approved leave of absence shall be excluded from the maximum established time frame. Students are ineligible for financial aid funds while on leave of absence.

4. Students who are registered through the Office of University Students are not eligible for financial aid funds through the School of Medicine and Health Sciences. In these cases, the University Office of Student Financial Assistance determines financial aid eligibility.

*Documentation.* Certification of the satisfactory academic progress of each student receiving financial assistance will be provided to the financial aid office by the associate dean for student affairs. This certification becomes part of the student's permanent file.

*Appeals.* The dean for academic affairs will be responsible for hearing appeals regarding satisfactory academic progress. The financial aid office will accept the decisions of the dean for academic affairs.

### Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc.,

#### Scholarship

- Anna Bartsch Scholarship Fund (1946)
- Jack I. Bender Scholarship Fund (1967)
- Everett Lamont Bradley Scholarship Fund (1954)
- Elma B. Carr Scholarship Fund (1976)
- Agnes Neuser Chowe Scholarship Fund
- Dr. Edith Seville Coale Scholarships (1965)
- Joseph Collins Foundation Scholarships (1951)
- Columbian Women Scholarship Funds\*
  - Estelle M. Corbett Scholarship Fund (1973)
  - Jessie Fant Evans Scholarship Fund (1967)
  - Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926)
- Oliver C. Cox Scholarship Fund (1973)
- Morris H. and Pauline L. Goldenberg Scholarship Fund (1979)
- Joan Luria Hines Scholarship (1968)
- Alec Horwitz Grant (1987)
- Albert A. and Esther C. Jones Scholarship Fund (1981)
- Ki-Wives of Washington Scholarship Fund (1958)
- Sidney A. Levine Scholarship Fund (1971)
- Barbara Logan, M.D., Scholarship Fund (1980)
- Loughran Medical Scholarship (1976)

\* The Columbian Women Scholarships are awarded to women who have completed a minimum of 15 hours at this University with a minimum B (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than January 18.



Medical School Student Financial Assistance Fund (1981)  
 Medical Student Summer Research Scholarships  
 Morris H. and Helen K. Rosenberg Medical Scholarship Fund (1986)  
 David Perry Steinman Memorial Scholarship Fund (1960)  
 Surdna Foundation Student Aid Fund (1985)  
 James J. Whisman Scholarship Fund (1966)  
 Gordon Fay Willey Scholarship (1974)  
 Winslow Foundation Scholarship (1974)

### Loan Funds

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students (1977)  
 Carroll Memorial Loan Fund (1981)  
 Eugene B. Casey Revolving Loan Fund (1988)  
 Consolidated Medical Student Loan Fund  
 A.M.A. Medical Student Loan Fund (1964)  
 Doreen and Donald Brown Loan Fund  
 Carr Loan Fund (1962)  
 Himes Loan Fund (1957)  
 Kellogg Medical School Loan Fund (1942)  
 Pfizer Loan Fund (1953)  
 School of Medicine Student Loan Fund (1952)  
 Sutherland Loan Fund (1941)  
 Wrather Loan Fund (1967)  
 Abraham I. Gimble Medical School Loan Fund (1977)  
 Katharine Graham Medical School Loan Fund  
 Dr. Esther A. Nathanson Memorial Medical Loan Fund (1977)  
 Student Council Loan Fund (1977)  
 Waller Loan Fund (1973)  
 Janice and George Wasserman Medical Student Loan Fund (1978)

In addition to the institutional loan funds listed above, two government loan programs are available to students pursuing the Doctor of Medicine. The *Health Professions Student Loan Program* and the *Perkins Loan Program* both require that students be citizens or permanent residents of the United States, be in good standing with the School, and have exceptional financial need as determined by federal regulations.

### Veterans Benefits

The Veterans Benefits Office, located on the third floor of Rice Hall, 2121 I Street, N.W., assists students entitled to educational benefits as active-duty personnel, veterans, or widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. The office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as active-duty personnel, veterans, or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is located at 941 North Capitol Street, N.E., Washington, D.C. 20421.



## Awards

*Janet N. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.* Awarded annually if the student ranking first in the graduating class is a woman.

*American Medical Women's Association, Inc., Scholarship Achievement Citation.* Awarded annually to those female students who are considered "honor graduates."

*CIBA-Geigy Award for Outstanding Community Service.* Awarded annually to a member of the sophomore class who has performed laudable extracurricular activity within the community.

*Paul L. DeWitt Award for Surgical Excellence.* Awarded annually to a member of the graduating class who has demonstrated outstanding ability and future potential in the specialty fields of surgery.

*Samuel M. and Miriam S. Dodek Award (1967).* Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

*Allie S. Freed Award (1957).* Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

*Walter Freeman Award (1966).* Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

*Donald H. Glew Memorial Awards.* Awarded annually to the winners of the Beaumont Day Competition in student research.

*James Douglas Goddard Award in Pharmacology.* Awarded annually to the outstanding sophomore medical student in pharmacology.

*Alec Horwitz Award (1959).* Awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

*Alec Horwitz First-Year Scholar Award (1986).* Awarded annually to the member of the second-year class who had the highest percentage of semester hours graded at the *Honors* level during the first year.

*Alec Horwitz Memorial Award (1984).* Awarded annually to a member of the sophomore class who attains the highest score on Part I of the National Board of Medical Examiners examination.

*Oscar Benwood Hunter Award (1952).* Established by the George Washington University Medical Society, now known as the George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

*Jacobi Medical Society Award (1962).* Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

*Howard Kane-A.F.A. King Obstetrical Society Award (1937).* Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

*Dr. Harold Lamport Biomedical Research Award.* Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport. Awarded annually to the student writing the best paper on original laboratory investigation in physiology.



*Lange Medical Publications Award.* Awarded annually to two members of the graduating class who are considered outstanding.

*Huran W. Lawson Award (1957).* Established by Mrs. Lawson in memory of her husband, who was a distinguished member of the medical staff of the University. Presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

*Lemmon Company Student Award.* Awarded annually to a member of the graduating class who has demonstrated outstanding ability in medicine.

*Benjamin Manchester Award (1966).* Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

*Merck Manual Awards.* Awarded annually to four members of the graduating class who show high scholastic achievement in medical studies.

*Julius S. Neviasser Award (1956).* Awarded annually to a member of the graduating class who has demonstrated outstanding ability in the clinical aspects of orthopaedic surgery.

*William Newman Award (1989).* Established in honor of the late, distinguished surgical pathologist, Dr. William Newman. Awarded annually to a member of the graduating class who has demonstrated great aptitude and interest in the field of pathology.

*John Ordronaux Award (1907).* Awarded annually to the member of the graduating class who has the highest scholastic standing.

*Hyman R. Posin Award (1982).* Established by Sheila Sloane Dusseau. Awarded annually to a member of the graduating class who has demonstrated outstanding sensitivity to neurologic patients and superior knowledge of neurology.

*Walter F. Rosenberg Award (1980).* Awarded to the senior medical student who shows the greatest interest, proficiency, and scholastic achievement in dermatology.

*Sandoz Award.* Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of psychiatry.

*William G. Schaffert Award.* Awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

*Upjohn Achievement Award.* Awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

*Alvin C. Wyman Award.* Awarded annually to a member of the graduating class who has demonstrated excellence in the study of radiology.

## Honor Societies

*Alpha Omega Alpha.* Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of this national medical honor society are eligible for election to membership.

*William Beaumont Medical Society.* Medical students who have performed original research in the life sciences are eligible for membership, based on the submission of an acceptable abstract of the research and election by society members. Outstanding students present their research findings at the annual Student Research Day. The society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

*Howard Kane-A.F.A. King Obstetrical Society.* The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.



## The Master of Public Health Degree Program

The School of Medicine and Health Sciences, recognizing the rapid changes under way in health care and the growing need for health professionals skilled in data management, epidemiology, preventive medicine, medical administration, and occupational and environmental health, offers a curriculum leading to the Master of Public Health (M.P.H.) degree. The program is designed to develop students' understanding of the operation and financing of health services delivery systems and the biological, physical, environmental, and social factors that affect the health of communities. In addition to taking core courses in public health, each student selects a specialty track in epidemiology-preventive medicine, administrative medicine, or occupational and environmental health. The program draws upon the resources of the School of Medicine and Health Sciences, the Department of Health Services Administration of the School of Government and Business Administration, and the metropolitan Washington public health community.

### Admission

#### Admission Requirements

Physicians, nurse practitioners, and physician assistants are eligible to apply to the Master of Public Health program for any of the specialty tracks. The occupational and environmental health track is also open to those with a bachelor's degree in a health field or a previous graduate degree. Admission requirements for each category of applicant are outlined below. Test scores for any applicant should not be more than five years old.

*Physicians.* Physician applicants must be graduates of recognized schools of medicine. They may submit scores on the Medical College Admission Test (MCAT), Graduate Management Admission Test (GMAT), or Graduate Record Examination (GRE), but are not required to do so. Graduates of foreign medical schools must submit scores on the Foreign Medical Graduate Examination in the Medical Sciences (FMGEMS), formerly the Educational Commission for Foreign Medical Graduates (ECFMG) examination, and the Federation Licensing Examination (FLEX), if these tests were taken.

*Nurse Practitioners and Physician Assistants.* The nurse practitioner or physician assistant must have a bachelor's degree from an accredited college or university. Those without a prior graduate degree must submit scores on the GMAT, GRE, or MCAT.

*Other Applicants.* Others who hold a bachelor's degree in a health field or a previous graduate degree may apply to the occupational and environmental health track only. Those who have not already earned a graduate degree must submit scores on the GMAT, GRE, or MCAT.

#### Application Procedures

Application forms are available from the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences, Box 32, 2300 I Street, N.W., Washington, D.C. 20037. The completed form must be returned with a nonrefundable \$45 application fee, payable by check or money order to the George Washington University. The fee is waived for students applying for readmission who were enrolled as degree candidates.



dates at the time of their last registration at this University and who have not since registered at another institution.

Included with the M.P.H. application are two recommendation forms, which must be completed by individuals familiar with the applicant's professional or academic performance. Recommendations should be submitted directly to the M.P.H. Admissions Office by the evaluators. The applicant must also request official transcripts from *all* institutions attended as an undergraduate or graduate student, regardless of whether credit was earned or desired. Transcripts should be sent directly to the M.P.H. Admissions Office from the registrar of each school. Scores on the GMAT, GRE, or MCAT—if required—must also be submitted directly by the testing agency.

Those interested in the joint M.D.-M.P.H. program must apply to both programs. When the applicant has been admitted to the M.D. program, the M.P.H. application will be reviewed. Transcripts need be submitted only with the M.D. application. Required recommendations, however, must be sent separately to each program, and M.P.H. recommendations must be submitted on the forms included in the application packet. Applicants to the joint program pay only the M.D. application fee.

Those seeking admission to the joint Physician Assistant-M.P.H. program must complete the application forms for each program, available from the M.P.H. Admissions Office. Such applicants pay only the M.P.H. application fee.

### Admission on Probation

Applicants may be admitted on probation at the discretion of the admissions committee. Such applicants are required to register in the fall semester for a minimum of two core courses from their chosen specialty track and to receive a grade of *B* or better in each course in order to be admitted to degree candidacy. Students admitted on probation should consult the coordinator of their specialty track immediately after the examination period of their first semester to determine whether the conditions for admission have been satisfied.

### Transfer of Credit

Up to 12 semester hours of applicable graduate course work completed at an accredited university may be accepted in transfer. The course work must have been taken within the past three years, and the student must have earned a grade of *B* or better. Petitions for transfer of credit must be approved by the coordinator of the student's specialty track and the dean. Transcripts and descriptions of the courses must be on file before such petitions can be considered.

### International Applicants

**Required Records.** At the time the application is submitted, the applicant must have the educational institutions previously attended send directly to the M.P.H. Admissions Office copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all colleges and universities attended are required. These copies become the property of the University and cannot be returned. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by an English translation.

**Language Test.** Students whose native language is not English must show competence in the language by scoring not less than 550 on the first taking of the Test of English as a Foreign Language (TOEFL) or 600 on the second taking.



Applicants are responsible for making arrangements to take the test and should address inquiries to TOEFL, CN 6151, Princeton, N.J. 08541-6151, U.S.A., well in advance of the semester for which admission is sought. On the application for the TOEFL, applicants should specify that their scores be sent to the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences, Box 32, 2300 I Street, N.W., Washington, D.C. 20037. Registration for the TOEFL does not constitute application for admission to George Washington University.

Admitted students who did not score at least 600 on the TOEFL and 5 out of 6 on the Test of Written English (TWE) will be required to take the GWU English as a Foreign Language placement test before registering at the University. The results of this test will determine what level of English as a Foreign Language course work, if any, the student will be required to complete before beginning M.P.H. studies. This requirement may extend the length of time needed to complete the program.

*Financial Certificate.* All international students planning to study at the University under the authorization of a student (F) or exchange visitor (J) visa must complete a Financial Certificate and submit it with the application for admission. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66. Students who need F or J visas should submit their applications, required records, and TOEFL scores no later than April 1.

## Joint Programs

Qualified individuals may pursue the Master of Public Health in conjunction with a clinical program leading to the Doctor of Medicine degree or the physician assistant certificate. Students must be admitted to each program and must fulfill all requirements for each degree or certificate.

*Doctor of Medicine and Master of Public Health.* This joint program is scheduled to allow students to complete both the M.P.H. and M.D. degrees and enter residency training on the usual timetable. Students in the program begin M.P.H. course work in the summer before or after the first year of medical school, taking 6 semester hours in a five-week session that starts in mid-July, and continue to take M.P.H. courses as electives during the second year of medical school. Fourth-year medical students in the joint program join full-time M.P.H. students for the spring semester and a five-week summer session that ends in June. The program director must approve the M.P.H. program of study, and the assistant dean for student affairs approves the course of study for the senior year of medical school. The amount of credit that may be applied toward both degrees is determined by the assistant dean.

*Physician Assistant Certificate and Master of Public Health.* Full-time students may complete this joint program in three calendar years. All didactic-course requirements of the physician assistant program and most M.P.H. courses are completed during the first two years, while the third year consists primarily of clinical rotations in a variety of health care settings. For specific requirements of the physician assistant certificate program, see page 68.

## Program of Study

### Degree Requirements

The Master of Public Health program consists of a minimum of 33 semester hours of course work. Fifteen semester hours of core courses are required for all M.P.H. students—PubH 201, 202, 205, 206, 211, and 213. The remaining 18 hours are taken in a specialty track.



The epidemiology-preventive medicine track offers comprehensive study in epidemiology and its applications to public health, medicine, and clinical research. Course work is designed to develop skills in implementing principles of preventive medicine and epidemiologic analysis. Required courses include PubH 220, 221, 222, 223, 230, 240, 293, and 295.

The administrative medicine track focuses on the administration, financing, management, planning, and marketing of health care and public health systems. Quantitative methods and principles of health systems management are emphasized. Required courses include PubH 214, 230, 263, 265, and 296 and an elective chosen from selected course offerings in health services administration.\*

The occupational and environmental health track provides a thorough background in the principles and methods of the field and develops skills in policy formulation and implementation. Students choose an emphasis on occupational medicine or environmental health. Required courses include PubH 220, 221, 230, 231, 241, 294, and 295.

Students in one specialty track may take course work in another only with the permission of the program director.

The student's program of studies must be approved by the specialty track coordinator and filed in the dean's office. A program of studies may be revised, when necessary, by obtaining the required approvals and filing the revisions in the dean's office.

### Other Program Requirements

All students must demonstrate a basic knowledge of statistics through satisfactory completion of an introductory statistics course or the autotutorial offered as part of PubH 202, *Biostatistical Applications for Public Health*. Students who pursue the administrative medicine specialty track must also have a basic knowledge of accounting, as demonstrated by satisfactory completion of an introductory accounting course or an autotutorial offered by the M.P.H. program. These requirements may be completed either before entering the M.P.H. program or as part of the program, but any credit earned in fulfilling them does not apply toward the degree.

### Scholarship Requirements

M.P.H. candidates are required to maintain a minimum cumulative quality-point index of 3.0 in course work required for the degree. Grades in courses taken at other institutions are not considered in computing the quality-point index. For students in the joint M.D.-M.P.H. program, the regulations for M.D. candidates apply to work in all courses credited to the M.D. degree.

A student may repeat a course in which a grade of C was received only with the written permission of the coordinator of the student's specialty track and the approval of the associate director of the program. If a course is repeated, the first grade remains on the student's record and is included in the cumulative quality-point index.

A student whose quality-point index falls below 3.0 will be placed on probation. This probation extends through the period in which the student next attempts 9 semester hours of work. During this period, the student's performance will be monitored to determine whether further study will be allowed. Failure to raise the quality-point index to 3.0 may result in suspension. A student so suspended may apply for readmission after the lapse of one semester, submitting evidence that he

\* For descriptions of health services administration courses, see the *Undergraduate and Graduate Programs Bulletin*.



or she is now better prepared to pursue graduate course work. If the student fails to achieve the minimum quality-point index at the end of the semester following readmission, it will be recommended that graduate study be terminated and further enrollment prohibited. Such recommendation will be reviewed by the dean for academic affairs; at the dean's discretion, the recommendation may also be reviewed by a faculty committee.

A student who receives a grade of *F* for a course in the M.P.H. program may also be recommended for suspension. To remain in the program, the student must submit to the program director a written statement from the specialty track coordinator justifying the student's continuance in the program and outlining the procedure to be followed. Continuation is contingent upon the dean's approval. The failing grade remains as part of the student's permanent record and is included in calculation of the quality-point index, even if the course is repeated. A student who is suspended for receiving an *F* may apply for readmission after the lapse of one academic year. Such applications will be reviewed competitively with new applications, and, if readmitted, the student will be subject to the requirements and regulations then in force.

### Use of Correct English

An instructor may inform the program director if a student's written or spoken English in any course is unsatisfactory. The program director, in turn, may refer the student for further evaluation and recommendation.

### Time Limits

All degree requirements must be completed within four years of the date of matriculation in the program, except for students in the joint M.D.-M.P.H. program, who have five years. The time limit does not include any period spent on approved leave of absence.

### Academic Advising

The coordinator of the student's specialty track is responsible for monitoring progress and providing information about the curriculum, specific courses of study, and career opportunities.

## Regulations

### Attendance

Students may attend only those classes for which they are registered. Regular attendance is expected.

### Grades

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, In Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal.

When another grade has not been assigned, the symbol *I*, *IP*, *W*, or *Z* will be recorded. The grade of *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work for a course. Incomplete work must be made up by a date agreed on by the instructor and the student but no later than the last day of the examination period for the semester immediately following the semester or summer session in which the grade of *I* is



assigned. When work for the course is completed, the grade earned will be indicated in the form of *I* followed by the grade. The indication of *I* cannot be removed from the transcript. An Incomplete that is not changed within the specified period automatically becomes an *I/F*. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

The symbol *IP* is reserved for courses (such as special projects) in which the final class date extends beyond the official University deadline for submitting grades.

For students in the joint M.D.-M.P.H. program, courses applied toward both degrees will be listed on each transcript using the grading system of the applicable program. Grade equivalents are as follows: *A = Honors, B = Pass, C = Conditional, F = Fail.*

### Changes in Program of Study

A student may not change specialty tracks or intended schedule for completion of the program, substitute one course for another, drop courses, or change status from credit to audit or audit to credit without the approval of the course instructor, the specialty track coordinator, and the dean.

**Adding Courses.** The deadline for adding a course is the end of the second week following general registration for the semester.

**Withdrawal.** Withdrawal from a course or from the University requires the approval of the coordinator of the student's specialty track, each course instructor, and the dean. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record (see Payment of Fees, page 13). The deadline for withdrawal from a course is the end of the eighth week following general registration for the semester.

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations, page 12.

### Credit

Credit is awarded only after registration for a course and satisfactory completion of the required work, or upon approval of a transfer of credit.

### Auditing

A student who has been admitted to the M.P.H. program may register as an auditor in a class only with the permission of the instructor and the program director. An auditor receives no academic credit and is not required to take active part in the class or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. The on-campus tuition rate is charged for audited courses.

### Continuous Enrollment

Once registered in a degree program, students are expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester until the degree is conferred. A student who is within the time limits of the degree and has fulfilled all program requirements but is completing outstanding work in a course for which the grade of Incomplete was received must register for Continuous Enrollment each semester.

Students who break continuous enrollment at the University and do not request and receive a leave of absence (see below) must apply for readmission and, if granted, are subject to the requirements and regulations then in force.



### Leave of Absence

A student who must interrupt active pursuit of the degree may petition the program director for a leave of absence for a specific period of time, generally limited to one calendar year. If the petition is approved, students must complete a Continuous Enrollment form and return it to 719C Ross Hall. Degree candidates who discontinue their studies without being granted a leave of absence and students granted leaves who do not return to active study at the close of the period of approved absence must apply for readmission and are subject to the regulations and requirements then in effect.

### Graduation Requirements

Degrees are conferred in February, May, and September. Applications for graduation must be filed by October 1 for February graduation, February 1 for May graduation, and July 1 for September graduation. Graduating students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May. Students who have completed all requirements but have not been awarded the degree will be issued a letter to this effect upon request.

To be recommended for graduation by the faculty, students must have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree; have filed an application for graduation prior to the published deadline; and be free from all indebtedness to the University. Registration, either for course work or for Continuous Enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

### Unclassified Students

With the program director's permission, unclassified students may register for courses in the M.P.H. program if space is available. An unclassified student who is subsequently admitted to the M.P.H. program may apply a maximum of 12 semester hours of credit toward the degree with the approval of the program director.

### Financial Aid

Limited financial aid, primarily in the form of loans, is available to full-time M.P.H. students. A limited amount of fellowship assistance is available to students in the joint M.D.-M.P.H. and Physician Assistant-M.P.H. programs. For further information on financial aid programs and deadlines, including information on veterans benefits, contact the Office of Student Financial Assistance, George Washington University, Washington, D.C. 20052. M.D.-M.P.H. applicants should contact the Director of Financial Aid, GWU School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037.



## Undergraduate Health Sciences Programs

The School of Medicine and Health Sciences offers a broad range of undergraduate programs to prepare health sciences professionals for roles in selected disciplines that complement the medical profession. Recognizing the nation's intricately structured health care system, these programs emphasize the interdependent roles and responsibilities of the network of professionals who bring a variety of skills and expertise to the health care team. The programs in medical laboratory technique,\* nuclear medicine technology, prehospital clinical medicine, radiation therapy technology, and radiologic technology\* lead to the Associate in Science. The Advanced Hospital Corps School and nuclear undersea medical technology programs lead to the Bachelor of Science in Health Science,\* and the Bachelor of Science is awarded for completion of the emergency medical services, medical record administration, medical technology, nursing anesthesia, physician assistant, and radiological sciences and administration programs. In addition, certificates are awarded to degree candidates in the following programs who complete designated requirements: medical record administration, medical technology, nuclear medicine technology (on-campus students only), nurse practitioner, nursing anesthesia, physician assistant, and radiation therapy technology. Curricula leading to the certificate only are available in the medical technology, nuclear medicine technology, nurse practitioner, and radiation therapy technology programs.

### Admission

Applicants to any of the health sciences programs at George Washington University must submit a completed application form together with a nonrefundable \$45 fee. The fee is waived for GWU degree candidates who are applying to the clinical (fourth) year of the medical technology program, for off-campus military and other contract students, and for students applying for readmission who were enrolled as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Application forms are available from the office of the program to which admission is sought, except for the first three years of the medical technology program; such applicants should request forms from the Office of Admissions, George Washington University, Washington, D.C. 20052. Applicants should refer to the individual program descriptions for the appropriate mailing address and for information on additional prerequisites, supporting documents, and application deadlines, since these vary by program. Application forms for readmission are available from the Office of Health Sciences Programs Administration, George Washington University School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037. Completed applications for admission or readmission must be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

### Required Credentials

Credentials that must be submitted by all applicants are listed below. Please refer to the individual program descriptions for information on additional admission requirements.

\* For off-campus military students only.



Applicants should note that *official* transcripts and score reports must be forwarded directly to the Office of Admissions from the registrar of all academic institutions previously attended or from the issuing agency. Student copies are not acceptable.

#### *Applicants With No Previous Academic Credit*

1. An official transcript showing that the applicant graduated with an acceptable record from secondary school.
2. Official scores on the College Board Scholastic Aptitude Test (SAT) or the American College Testing (ACT) battery, if the applicant completed secondary school within two years of the date of application to a health sciences program. (If the applicant completed secondary school more than two years before the date of application, other tests may be required during the application process.)\*
3. Service school records, where applicable.

#### *Applicants With Fewer Than 30 Semester Hours of Academic Credit†*

1. An official transcript showing that the applicant graduated with an acceptable record from secondary school or has acceptable GED scores.
2. Official SAT or ACT scores, for applicants who completed secondary school less than two years before the date of application.\*
3. Official transcripts from each academic institution attended, regardless of whether credit was earned or is desired.
4. Service school records or military discharge papers, where applicable.
5. Official College Board College-Level Examination Program (CLEP) score reports, where applicable.

#### *Applicants With 30 or More Semester Hours of Academic Credit‡*

1. An official transcript showing that the applicant completed acceptable course work at an accredited college or university, maintained a cumulative grade-point average of 2.0 out of a possible 4.0, is in good standing as to scholarship and conduct, and is eligible to return to the academic institution most recently attended in the same semester for which admission is now sought to George Washington University. Transcripts are required from each academic institution attended, regardless of whether credit was earned or is desired. Students who have been academically dismissed or suspended more than twice will not be considered for admission for at least five years from the date of their last suspension or dismissal.
2. Service school records or military discharge papers, where applicable.
3. Official CLEP score reports, where applicable.

#### **Students From Foreign Institutions**

**Required Records.** Applicants must request copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received from all educational institutions attended. Each institution should mail these credentials directly to the Office of Admissions, George Washington University, Washington, D.C. 20052. Official copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of

\* Off-campus military students do not need to submit SAT or ACT scores.

† Fewer than 12 semester hours for off-campus students.

‡ Twelve or more semester hours for off-campus students.



state examinations and certificates are also required. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation. All records become the property of the University and cannot be returned.

**Language Tests.** All applicants whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL), and the University looks for a minimum score of 550 in considering candidates for admission. Applicants are responsible for making arrangements to take the test and should address inquiries to TOEFL, Educational Testing Service, CN 6151, Princeton, N.J. 08541-6151, U.S.A., well in advance of the semester for which admission is sought. On the application for the TOEFL, students should specify that the scores are to be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052. Registration for the TOEFL does not constitute application for admission to George Washington University.

In addition, admitted students who did not score at least 600 on the TOEFL and 5 out of 6 on the Test of Written English (TWE) will be required to take the GWU English as a Foreign Language (EFL) placement test prior to registration. The results of this test will determine what level of EFL course work, if any, the student will be required to complete before beginning a full program of study in a health sciences curriculum. College credit is not granted for English study below the level of standard freshman English courses.

**Financial Certificate.** A Financial Certificate must be completed and submitted with the application for admission of all international students planning to study at the University under the authorization of either a student (F) or exchange visitor (J) visa. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66.

### Advance Tuition Deposit

Upon notification of acceptance, a \$200 tuition deposit will be required of all full-time, on-campus undergraduate students, including those readmitted. The deposit is credited toward tuition and is not refundable.

### Admission as an Unclassified Student

A student who wishes to take individual courses in health sciences programs must apply for admission to the University as an unclassified undergraduate student in the School of Medicine and Health Sciences. The assistant dean, in conjunction with the appropriate program director and the chair of the department offering the course, will determine whether admission will be granted to unclassified students. Credit earned for courses taken as an unclassified student may be transferred to a degree program at the University if the courses are applicable to the program. Permission to take individual courses, if granted, will generally be limited to a total of 6 semester hours.

### Advanced Standing

Advanced standing may be awarded toward the associate's and bachelor's degrees for appropriate course work completed with a minimum grade of C at other accredited academic institutions. Advanced standing may also be awarded for nontraditional classroom or clinical experience. The University reserves the right to refuse transfer credit in part or in whole.

Transfer credit is not awarded for English language courses taken in a non-English-speaking country.



Degree candidates who are currently enrolled at this institution and plan to take placement examinations or courses at other accredited institutions for transfer credit must first obtain permission from the Office of Health Sciences Programs Administration.

*Transfer Credit From Academic Institutions.* Health sciences degree programs vary in the amount of advanced standing they will award. Students may obtain further information from the Office of Health Sciences Programs Administration.

*Credit for Nontraditional Classroom or Clinical Experience.* Credit may be awarded for nontraditional classroom or clinical experience through one or any combination of the following:

*Credit from Service Schools.* A limited amount of credit may be assigned for selected service school instruction. Current military students must submit an official DD Form 295; copies of service school records are not acceptable. Veterans should submit photocopies of their discharge papers (Form DD214).

*Special Departmental Examinations.* A student may request approval from the assistant dean, through the program director, to petition one department to take a special examination covering the subject matter of a specific course. Approval of such a request is not granted automatically; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. Assigning credit by special departmental examination will depend on the department's evaluation of the examination. The examinations will normally be of at least three hours' duration. A \$50 fee for each course examination is charged for preparing, administering, and grading the examination. (In some instances, students may instead request approval to take a waiver examination to satisfy a curriculum requirement. Students do not receive academic credit for waiver examinations. The examination will normally be of at least one hour's duration; a \$20 fee is charged for each waiver examination.)

*Credit for College Board College-Level Examination Program (CLEP).* CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, humanities, natural sciences, English composition, and social sciences and history. The CLEP General Examinations in mathematics and English, however, will not fulfill any degree requirements for health sciences students; only the Subject Examinations are acceptable in these areas.

Upon admission to degree candidacy, credit is assigned for General Examinations in natural sciences, humanities, and social science and history passed with acceptable scores. Credit is usually assigned for Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after taking an equivalent course. Arrangements for taking the examinations are the responsibility of the applicant and should be made through the College Board College-Level Examination Program, CN 6601, Princeton, N.J. 08541-6601.

*Credit for New York State Board of Regents Examination.* Applicants for degrees who present proper certification of the award of a degree at the associate's level from the New York State Board of Regents may be awarded a maximum of 60 semester hours of advanced standing.

### Readmission

Students previously registered in the University who were not registered the immediately preceding semester (summer sessions excluded) must apply for readmission. Students who have attended one or more academic institutions while absent from this University must have complete official transcripts sent directly to



the Office of Admissions from each institution attended. (Active duty or reserve military students who have attended additional service schools must also submit an updated DD Form 295.) Students seeking readmission as degree candidates after previous enrollment in unclassified status must submit all entrance credentials not previously received or required.

Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for students applying for readmission after previous enrollment as degree candidates at this University if they have not since registered at another institution.

## Regulations

### Attendance

Students may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

### Scholarship Requirements

**Grades.** Grades are mailed to students from the Office of the Registrar each semester. Grades are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, In Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. Other grades that may be assigned are *A-*, *B+*, *B-*, *C+*, *C-*, *D+*, and *D-*. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of *D* or better was received, unless a petition to do so is approved by the assistant dean upon recommendation of the program director.

When another grade has not been assigned, the symbol *I*, *IP*, *W*, or *Z* will be recorded. The symbol *I* indicates that the instructor has received a satisfactory explanation for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. An *I* automatically becomes an *F* if the uncompleted work has not been made up within one calendar year of the date of the last class meeting in the semester for which the *I* was assigned. *IP* is reserved for courses (for example, clinical rotations) in which the final date extends beyond the official University deadline for submitting grades.

**The Quality-Point Index.** Scholarship is computed in terms of the quality-point index (QPI), obtained by dividing the number of quality points by the number of semester hours for which the student has registered, based only on the student's record in this University. Quality points are computed from grades as follows: *A*, 4.0; *A-*, 3.7; *B+*, 3.3; *B*, 3.0; *B-*, 2.7; *C+*, 2.3; *C*, 2.0; *C-*, 1.7; *D+*, 1.3; *D*, 1.0; *D-*, 0.7; *F*, 0, for each semester hour for which the student has registered in a degree program. (Grades of *F* will be computed in the QPI but will not be considered in fulfilling degree requirements.) Courses marked *W*, *I*, or *IP* are not considered in determining the index, except that any course in which an *I* or *IP* has been assigned



will be included when a final grade has been recorded. Grades earned at other institutions are not included in computing the QPI.

**Dean's List.** Students who achieve a QPI of 3.5 or higher in any one semester are placed on the Dean's List for that semester. The Dean's List is limited to full-time students.

**Probation.** A student who has attempted a minimum of 12 semester hours of course work and whose cumulative QPI is below 2.0 will be placed on *academic probation*. This probation extends over the period in which the student attempts another 12 semester hours of course work.

Students whose attendance or conduct has been unsatisfactory may be placed on *disciplinary probation* for the period in which they attempt the next 12 semester hours of course work.

**Suspension.** Any student whose cumulative QPI remains below 2.0 after a 12 semester-hour period of probation may be suspended. A student suspended for poor scholarship may not register for course work, even as an auditor. A suspended student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the assistant dean, through the student's program director, demonstrating that the student is now better prepared to pursue college-level course work. Any student suspended twice for poor scholarship will not be readmitted.

**Dismissal.** Any student who has received one or more failing grades during a semester may be recommended for dismissal by the program director. Such recommendation will be reviewed by the assistant dean and the dean for academic affairs; at the discretion of the dean for academic affairs, the recommendation may also be reviewed by a faculty committee.

### Withdrawal

Withdrawal from a course or from the University requires the approval of the student's advisor, each course instructor, and the assistant dean. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record (see Payment of Fees, page 13). The deadline for withdrawal from a course is the end of the fourth week following general registration for the semester (except for off-campus military students).

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations, page 12.

### Adding Courses

The deadline for adding a course is the end of the second week following general registration for the semester.

### Changes in Program of Study

**Changes Within Health Sciences Programs.** A student may not substitute one course for another, drop courses (see Withdrawal), or change status from credit to audit or audit to credit without the approval of the faculty advisor, the course instructor, and the assistant dean.

**Transfer Within the University.** Application for transfer to another college, school, or division must be made to the appropriate admitting office on the form provided by that office. A maximum of 30 semester hours earned in the Division of Continuing Education may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.



### Credit

Credit is awarded only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

### Auditing

A student who has been admitted to a health sciences program may register as an auditor in a class only with the permission of the instructor, the faculty advisor, and the assistant dean. An auditor receives no academic credit and is not required to take active part in the class or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. The on-campus tuition rate is charged for audited courses.

### Balance Sheet

After a student has been admitted and has completed the registration process in a particular degree program, program coordinators in the Office of Health Sciences Programs Administration will issue a balance sheet showing course work already completed and degree requirements still to be met. A second balance sheet is issued only if the student changes the major.

### Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of \$2 is charged for each transcript. Partial transcripts are not issued.

### Continuous Enrollment

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Students who break continuous enrollment at the University and do not request and receive a leave of absence (see below) must apply for readmission and, if granted, are subject to the requirements and regulations then in force. Special provision is made for military students who have completed the certificate components of their programs but, because of work assignment, cannot immediately complete degree requirements. Such students are registered in Continuous Enrollment until they are able to resume course work.

Students who plan to attend other institutions and apply credit so earned toward graduation from this University must first obtain written approval from the assistant dean.

### Leave of Absence

A student who must interrupt active pursuit of the degree may petition the assistant dean, through the program director, for a leave of absence for a specific period of time, generally limited to one calendar year. If the petition is approved, the student must complete a Continuous Enrollment form and return it to the Office of Health Sciences Programs Administration. Degree candidates who discontinue their studies without being granted a leave of absence and students granted leaves who do not return to active study at the close of the period of approved absence must



apply for readmission and are subject to the regulations and requirements then in force. The right to use of University facilities is suspended while the leave is in effect.

### Graduation Requirements

Degrees are conferred in February, May, and September. Graduating health sciences students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May.

To be recommended for graduation by the faculty, students must have met the admission requirements of the college or school in which they are registered; have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree; have filed an application for graduation prior to the published deadline; and be free from all indebtedness to the University. Registration, either for course work or for continuous enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

**Application for Graduation.** Applications for graduation must be filed by October 1 for February graduation, February 1 for May graduation, and July 1 for September graduation. (Off-campus military students should apply upon completion of all degree requirements.)

**Scholarship.** Students must meet the scholarship requirements for the particular degree for which they are registered.

**Curriculum.** Minimum curriculum requirements for each degree are given on pages 55-66.

### Honors

Bachelor's degrees with honors are awarded to students whose academic records give evidence of particular merit. The student's quality-point index determines the level of honors as follows: *cum laude*, 3.4-3.59; *magna cum laude*, 3.6-3.79; *summa cum laude*, 3.8-4.0.

The quality-point index is calculated by the Office of the Registrar, and the honors designation is entered on the transcript and diploma of those students who earn an honors designation. The quality-point index includes all course work completed at GWU and is not rounded off. To be eligible for an honors designation, a student must complete at least 60 hours of course work at GWU.

### Award of Certificates to Degree Candidates

Certificates are awarded to degree candidates who successfully complete designated requirements in the medical record administration, medical technology, nuclear medicine technology, nursing anesthesia, physician assistant, and radiation therapy technology programs. In addition, certificate recipients must be free from all financial indebtedness to the University.

### Financial Aid

For full-time undergraduate students, George Washington University has a program of financial assistance consisting of scholarships, grants, loans, and part-time employment. Aid is awarded on the basis of academic achievement and demonstrated financial need.

In general, consideration for financial aid is restricted to students in good academic standing who meet the minimum grade-point average for particular awards and are not financially encumbered by any other University office. All



undergraduate gift aid (institutional scholarships and grants and federal grants) requires that the student be working on the first undergraduate degree. Undergraduate gift aid and all federal aid require that the recipient be registered for a full-time course load at GWU.

Students intending to apply for financial aid should submit the completed financial aid application and the application for admission by February 1, since all applications for financial aid must be filed by that date regardless of whether the student has been admitted yet. Applications for institutional or federal aid cannot be processed if the relevant tax returns have not been filed in accordance with the IRS Code. Documents submitted as part of aid applications become the property of the University and cannot be returned. Federal regulations require that the University report suspected cases of fraud or misrepresentation to the appropriate federal, state, and local authorities.

Complete information on financial assistance and the necessary application materials are available from the Office of Student Financial Assistance, George Washington University, Washington, D.C. 20052.

## **Programs Leading to the Associate in Science**

Satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; some programs, however, may set requirements above the minimum. See individual program descriptions for information on course distribution.

Students who may wish to pursue a bachelor's degree later are advised to plan their associate's degree program so that, where possible, they will satisfy the prerequisites of the baccalaureate.

### **Scholarship Requirements**

A minimum cumulative QPI of 2.0 is required in course work leading to the degree of Associate in Science. A minimum cumulative QPI of 2.5 is required for course work in the core curriculum. A student whose QPI in the core curriculum falls below 2.5 in any one semester will receive a warning letter.

### **Residence Requirement**

A minimum of 18 semester hours of course work in the major must be satisfactorily completed in residence at the School of Medicine and Health Sciences.

## **Medical Laboratory Technique Program**

The program of study leading to the degree of Associate in Science with a major in medical laboratory technique is offered only to off-campus military students.

### **Admission to Degree Candidacy**

General requirements for admission to degree candidacy are stated on pages 47-51. Students who do not meet these requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5, or upon completion of 15 semester hours of acceptable (2.5) and transferable course work.



### Degree Requirements

The program requires satisfactory completion of a minimum of 61 semester hours of course work, distributed as follows:

*Human Competence.* 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent) and 6 semester hours of college math or 3 semester hours of college math and a humanities or social science elective.

*Core Curriculum (required courses).* Path 13, 14, 15, 16, 17, 18, 19, 20; Chem 11 (the latter is not included in computing the QPI). This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

### Nuclear Medicine Technology Program

The program of study leading to the degree of Associate in Science with a major in nuclear medicine technology is offered to on-campus students and to off-campus military students.

### Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 47-51. Applicants must be at least 18 years of age by the time they first register in the program. Two letters of recommendation must be sent directly from previous instructors, advisors, or employers. The selection process includes a personal interview for qualified applicants. Enrollment is limited. Students who do not meet the standard requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5, or upon completion of 15 semester hours of acceptable (2.5) and transferable course work.

### Degree Requirements

Satisfactory completion of 70 semester hours of course work is required. Anat 115, Chem 11-12, Phyl 111, and Phys 1, or their equivalents, are prerequisite to all courses in nuclear medicine technology.

*Human Competence.* 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent), 3 semester hours of general psychology, and 3 semester hours of humanities.

*Core Curriculum (required courses).* Rad 10, 43, 44-45-46, 55-56, 59, 66, 72, 73, 74, 130, 190. For off-campus military students, this requirement is fulfilled by successful completion of Nuclear Medicine Technology School (NEC 8416).

### Applications

Application forms for the on-campus program are available from the Radiological Health Sciences Programs Office, 2300 I Street, N.W., Washington, D.C. 20037. The deadline for return of completed applications is April 30.

### Prehospital Clinical Medicine Program

The program of study leads to the degree of Associate in Science with a major in prehospital clinical medicine.



## Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 47-51. In addition, students must submit the following records directly to the GWU Office of Admissions:

1. Photocopies of scores or certificates from national registry examinations or certifying boards (where applicable).
2. Verification of satisfactory completion of prehospital clinical training and proof of current participation in an emergency medical services system (where applicable).
3. Two letters of recommendation from previous instructors, advisors, or employers involved in emergency medical services.

A personal interview may be required. Students admitted to the program must submit, before the first day of class, a letter from a physician attesting to their good health. The letter should include the results of testing for tuberculosis and a statement of current immunization status. Applicants who do not meet the academic requirements for admission to degree candidacy may reapply after satisfactory completion of a 15-semester-hour probationary period completed in residence at the George Washington University School of Medicine and Health Sciences.

## Advanced Standing

General provisions for advanced standing are listed on pages 49-50. Advanced standing may be granted for satisfactory completion of certificate-level course work in prehospital emergency care, after the candidate submits official transcripts or records from an accredited, certificate-granting medical facility. Advanced standing may also be earned for special departmental examinations passed at specified levels. A \$50 fee will be charged for each special departmental examination.

## Degree Requirements

The program requires satisfactory completion of a minimum of 60 semester hours of course work, distributed as follows:

*Human Competence.* 18 semester hours, including 6 hours of English (Engl 9 or 10 and 11 or 12), 3 hours of psychology or sociology, BAD 110, Educ 180, and Stat 51.

*Core Curriculum (required courses).* EMed 10, 18, 61, 62, 65, 66, and 6 hours of program electives.

## Applications

Application forms are available from the Director, Emergency Medical Services Degree Programs, 2140 Pennsylvania Avenue, N.W., Washington, D.C. 20037. The deadline for return of completed applications is July 30.

## Radiation Therapy Technology Program

The program of study leads to the degree of Associate in Science with a major in radiation therapy technology.

## Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 47-51. Applicants must be 18 years of age by the time they first register in the



program. Two letters of recommendation must be sent directly from previous instructors, advisors, or employers. The selection process includes a personal interview for qualified applicants. Enrollment is limited. Applicants who do not meet the standard requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5.

### Degree Requirements

Satisfactory completion of at least 61 semester hours of course work is required for the Associate in Science degree, distributed as follows:

*Human Competence.* 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent).

*Core Curriculum (required courses).* Anat 115; HCS 116; Phyl 111; Rad 10, 11, 12, 14, 15, 16-17-18, 19, 20-21, 23 (9 hours), 25, 33, 130, 190.

### Applications

Application forms are available from the Radiological Health Sciences Programs Office, 2300 I Street, N.W., Washington, D.C. 20037. The deadline for return of completed applications is April 30.

### Radiologic Technology Program

The program of study leading to the degree of Associate in Science with a major in radiologic technology is offered only to off-campus military students.

### Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 47-51. Students who do not meet the standard requirements may be considered for admission to degree candidacy after satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at GWU, with a minimum QPI of 2.5, or upon completion of 15 semester hours of acceptable (2.5) and transferable course work.

### Degree Requirements

The program requires satisfactory completion of 62 semester hours of course work distributed as follows:

*Human Competence.* 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent), 3 semester hours of social science, and 3 semester hours of humanities.

*Core Curriculum (required courses).* Rad 40-41-42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99, 100. This requirement is fulfilled by successful completion of Radiologic Technology School (NEC 8452).

### Programs Leading to the Bachelor of Science in Health Science

The Bachelor of Science in Health Science degree programs are offered only to off-campus military students.



## Advanced Hospital Corps School Program

Degree requirements are as follows:

**Human Competence.** 30 semester hours, including 6 hours in English composition, 3 hours in general psychology, and 21 hours in the humanities and social sciences.

**Subject Competence.** 18 semester hours, including HCS 10, 15, and 16 and an additional 7 hours selected from the following areas: biological and physical sciences, mathematics, computer science, hospital administration, industrial hygiene, public health organization and administration, and environmental science. This requirement is fulfilled by successful completion of Advanced Hospital Corps School (NEC 8425).

**Vocational Competence.** 72 semester hours, consisting of HCS 22, 54, 67, 68, 75, 83, 87, 92, 93, 96, 102, 126, 133, 175, and 180 (a corresponding number of credits for approved course work in the area of subject competence may be substituted for HCS 175 and 180).

## Nuclear Undersea Medical Technology Program

Degree requirements are as follows:

**Human Competence.** 30 semester hours, including 6 hours in English composition (Engl 9 or 10 and 11 or 12), 3 hours in general psychology, and 21 hours in humanities and social sciences.

**Subject Competence.** 15 semester hours, consisting of HCS 15, 16, 20, and 21. This requirement is fulfilled by successful completion of NEC 8402.

**Vocational Competence.** 77 semester hours, including HCS 26, 66, 90, 93, 96, and 133 (this requirement is fulfilled by successful completion of NEC 8402) and an additional 9 hours in biological sciences, chemistry, computer science, emergency medical technology, environmental studies, geology, health science, industrial hygiene, physics, public health, or statistics.

## Programs Leading to the Bachelor of Science

Satisfactory completion of a minimum of 120 semester hours of course work is required for the Bachelor of Science degree; some programs, however, may set requirements above the minimum. See individual program descriptions for information on course distribution.

### Scholarship Requirements

A minimum cumulative QPI of 2.0 is required for course work in programs leading to the Bachelor of Science degree. A minimum cumulative QPI of 2.5 is required in core-curriculum courses. A student whose QPI in the core curriculum falls below 2.5 in any one semester will receive a warning letter.

## Emergency Medical Services Program

This program is designed for individuals interested in emergency medical services and emergency management. The program includes course work in the liberal arts, education, management, and occupational health and safety. In addition, the department offers the courses students must have to be eligible to take the National Registry Intermediate Paramedic and Paramedic examinations.



### Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 47-51. In addition, students applying to the program must submit the following records directly to the GWU Office of Admissions:

1. Verification of satisfactory completion of prehospital clinical training and proof of current participation in an emergency medical services system (where applicable).
2. Photocopies of scores or certificates from national registry examinations or certifying board examinations (where applicable).
3. Two letters of recommendation, sent directly to the Office of Admissions by instructors familiar with the applicant's academic preparation or colleagues familiar with the applicant's health care experience.

A personal interview may be required. Students admitted to the program must submit, before the first day of class, a letter from a physician attesting to their good health. The letter should include the results of testing for tuberculosis and a statement of current immunization status.

### Advanced Standing

General provisions for advanced standing are listed on pages 49-50. In addition, students may receive up to 60 semester hours of advanced standing for satisfactory completion of required course work at other accredited academic institutions. The program director reserves the right to refuse transfer credit in part or in whole.

### Degree Requirements

The program requires satisfactory completion of a minimum of 120 semester hours of course work, distributed as follows:

*Human Competence.* A minimum of 27 semester hours, including English composition, statistics, accountancy, psychology, sociology, business administration, personnel management, and computer science.

*Subject Competence.* 39 semester hours, including EMed 10, 18, 20, 30, 40, 50, 55, 140, and 200.

*Vocational Competence.* 54 semester hours, including 34 to 36 hours in one of the following areas of concentration: education, management, safety and occupational health, or clinical medicine. The remaining 18 to 20 hours may be satisfied by electives in emergency medicine or other disciplines.

### Residence Requirement

A minimum of 60 semester hours of course work in the major must be satisfactorily completed in residence at the School of Medicine and Health Sciences.

### Applications

Application forms are available from the Director, Emergency Medical Services Degree Programs, 2140 Pennsylvania Avenue, N.W., Washington, D.C. 20037, and should be completed and returned no later than July 30.

### Medical Record Administration Program

The program is designed for accredited record technicians, medical record technicians, and individuals completing medical record science courses at the technical level who wish to become medical record administrators. The program provides an



opportunity for graduates of the American Medical Record Association (AMRA) Independent Study Program or the Correspondence Course to receive academic credit for the medical record technology courses they have successfully completed.

The medical record administration program has been developed in compliance with the *Essentials and Guidelines of an Accredited Educational Program for the Medical Record Administrator* as approved by the AMRA Council on Education. The program will be reviewed for accreditation by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in cooperation with the AMRA Council on Education. When the program is accredited, students will be eligible to take the national qualifying examination for certification as registered record administrators.

### Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 47-51. In addition, students applying to the program must submit evidence that they have satisfactorily completed the subject and human competence requirements listed under Degree Requirements, below. Two recommendation forms must be sent directly from previous instructors or employers. A personal interview with the program director is required. All applications will be reviewed by the Office of Admissions and the medical record administration program faculty. Students will be advised of their admission status by the Office of Admissions.

### Advanced Standing

General provisions for advanced standing are listed on pages 49-50. In addition, students may receive up to 45 semester hours of advanced standing for completion of anatomy, physiology, pathophysiology, and medical record technology courses (including courses taken in the American Medical Record Association Independent Study Program or Correspondence Course), which may be applied toward fulfillment of the subject competence requirements. Students may also receive a minimum of 36 semester hours of advanced standing applicable toward fulfillment of the human competence requirements, including credit earned at other institutions.

### Degree Requirements

The program requires satisfactory completion of a minimum of 120 semester hours of course work. Students must earn a grade of C or better in each of the subject and human competencies and must maintain a minimum cumulative QPI of 2.5 in the major.

**Human Competence.** A minimum of 36 semester hours, including course work in accountancy, college algebra, data processing, economics, English composition, humanities and social sciences, personnel management, principles of management, and public speaking.

**Subject Competence.** 45 semester hours, consisting of courses in anatomy, physiology, microbiology, pathophysiology, and medical record technology.

**Vocational Competence.** 39 semester hours, including AHA 110, 120, 125, 135, 140, 150, 170, 176; HCS 197; HSA 206, 207, 215; Psys 144; Stat 51.

### Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.



## Applications

Application forms are available from the Director, Medical Record Administration Program, 2300 I Street, N.W., Washington, D.C. 20037, and should be completed and returned no later than July 30 for the fall semester or November 30 for the spring semester.

## Medical Technology Program

### Admission and Applications

Application forms for admission to the first three years of the program, as outlined under Degree Requirements, below, are available from the Office of Admissions, George Washington University, Washington, D.C. 20052.

Completion of the first three years of the program does not guarantee acceptance into the senior (clinical) year conducted at the University Hospital, although GWU students are given preference. Students must have maintained a QPI of 2.0 during the first three years to be considered for admission to the clinical year. Applicants will also be evaluated on the basis of academic achievement in the sciences, personal interviews, and letters of recommendation.

Students should apply for admission to the clinical year during their junior year; application is made to the Director, Medical Technology Program, 2300 I Street, N.W., Washington, D.C. 20037. Admission interviews take place between December and March.

### Degree Requirements

The program requires satisfactory completion of 124 semester hours of course work, distributed as outlined below.

#### First Three Years

*English.* 6 semester hours: Engl 9 or 10 and 11 or 12.

*Humanities and Social Sciences.* 12 semester hours, consisting of one 6-hour combination each from two of the following three categories:

Social and Behavioral Sciences—Anth 2 and 3, Anth 2 and 150, Econ 1-2, Geog 1 and 2, PSc 1 and 2, PSc 3-4, Psyc 1 and 8, Soc 1 and 2.

Literature—Chin 163-64, Chin 181-82, Engl 51-52, Engl 61-62, Engl 71-72, Ger 51-52, Ger 103-4, Ger 112 and 114, Japn 111-12, Rel 9-10, Slav 91-92, Hist 71-72, Hmn 1-2, Phil 51-52, Rel 1-2.

Western Society and Civilization—AmCv 71-72, Art 31-32, Clas 71-72, Hist 39-40, Hist 71-72, Hmn 1-2, Phil 51-52, Rel 1-2.

*Mathematics and Sciences.* 39 semester hours: BiSc 11-12, 111; 4 hours selected from BiSc 104, 127, 138, 145, 148, 155, 163, 164, 165; Chem 11-12, 22, 23, 50; Math 30, Micr 129.

*Nonscience Electives.* 18 semester hours.

*Science or Nonscience Electives.* 15 semester hours.

*Senior Year.* Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133; Bioc 111. The pathology courses in the senior (clinical) year constitute the core curriculum, and students must have a minimum cumulative QPI of 2.5 in these courses in order to graduate. Path 121 is a prerequisite to all other courses in the core curriculum. Students who fail this course will not be allowed to continue in the clinical year. They may, however, apply for readmission to the program and will be subject to the requirements and regulations then in force.



### Residence Requirement

A minimum of 34 semester hours must be completed in residence. This requirement is met through satisfactory completion of the senior year of the program, conducted at the University Hospital.

### Nursing Anesthesia Program

#### Admission to Degree Candidacy

General requirements for admission are stated on pages 47-51. In addition, an applicant to the nursing anesthesia program must fulfill the following prerequisites to be considered for admission:

1. Have completed successfully high-school or college-level mathematics (general mathematics or algebra) and two semesters of college-level general chemistry (Chem 11-12 or equivalent).
2. Be a graduate of a state-approved school of nursing; be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia; and have a minimum of 12 months of practical experience in critical-care nursing.
3. Be selected for admission to the school of anesthesia at an affiliated hospital before applying to the program at George Washington University. At present, the program has affiliations only with naval hospitals, and applicants must be recommended by the Navy for participation.

Students who graduated from nursing school more than five years ago and have not been active in the nursing profession during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

#### Advanced Standing

The general provisions for advanced standing are stated on pages 49-50. In addition, advanced standing will be awarded to students in the nursing anesthesia program as follows:

1. Students who are graduates of two- or three-year nursing school programs and have had a minimum of 12 months of practical experience in critical-care nursing may receive up to 45 hours of credit applicable toward the human and subject competence requirements.
2. Students who have earned a B.S. degree in nursing may receive up to 60 hours of credit applicable toward human and subject competence requirements.
3. Certified Registered Nurse Anesthetists (CRNAs) may petition for advanced standing and waiver of the clinical requirement on the basis of previous anesthesia work experience. They must demonstrate clinical competence before such petitions will be granted.

#### Degree Requirements

The program requires satisfactory completion of a minimum of 124 semester hours of course work, distributed as follows:

- Human Competence.** 30 semester hours, including 6 hours in English composition (Engl 9 or 10 and 11 or 12), 3 hours in psychology, and 21 hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).
- Subject Competence.** 30 semester hours of course work in the biological, physical, natural, and nursing sciences.



*Vocational Competence.* 64 semester hours, consisting of the following:  
*Year 1:* Anat 115; Anes 191, 198; Bioc 111; HCS 134; Phar 110-11, 124-25; Phyl 111.

*Year 2:* Anes 193-94, 195-96.

All students must complete Year 1 (the core curriculum) in residence, with a minimum cumulative QPI of 2.5. CRNAs may petition to waive Year 2 course work on the basis of successful completion of the core curriculum, demonstrated clinical competence, and satisfactory completion of an oral and/or written examination in the area of clinical anesthesia. The petition must be submitted to the assistant dean through the program director, for approval.

### Scholarship Requirements

Students who do not maintain a cumulative QPI of 2.5 in nursing anesthesia courses taken in the first two semesters may be required to take additional course work in order to achieve this minimum average.

### Residence Requirement

A minimum of 31 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

### Physician Assistant Program

The program is available to on-campus students and off-campus military students.

### Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 47-51. In addition, applicants must submit evidence that they have satisfactorily completed a minimum of 30 semester hours of college credit, including two semesters of general chemistry for science majors (biochemistry is recommended), two semesters of psychology (general and abnormal psychology are recommended), and two semesters of biological sciences (recommended courses in the biological sciences include human anatomy and physiology and general microbiology; botany is not acceptable). Direct patient care experience is strongly preferred but not required. Two evaluation forms, submitted directly by the evaluators, and a personal interview are required as part of the admission process (not applicable to off-campus military students).

### Advanced Standing

Advanced standing will not be granted toward courses in the major; advanced standing toward the baccalaureate, however, may be awarded for appropriate course work previously completed at other accredited institutions with a minimum grade of C.

### Degree Requirements

On-campus students must satisfactorily complete the following course work:  
*Human Competence.* 30 semester hours, including 6 hours in English composition (Engl 9 or 10 and 11 or 12) and 24 hours of course work selected from the humanities, social sciences, or mathematics.

*Subject and Vocational Competence.* 100 semester hours, consisting of the following (courses in the core curriculum are indicated by an asterisk).



*Basic Science Curriculum:* Anat 115; Bioc 111; Micr 128; Path 127, 128, 152; Phyl 111.

*Clinical Sciences:* HCS 109, 125,\* 134,\* 140, 145, 146, 147, 148, 193; Phar 158 (or 159 and 160).

*Clinical Rotations:* HCS 160,\* 163,\* 166, 169, 172,\* 175,\* 178, 198.

*Clinical Electives:* Two clinical electives must be chosen from the following list—HCS 158, 159, 176, 177, 186, 187, 188, 199.

*Other Required Courses:* HCS 113, 115, 116, 119, 137.

*Remedial Courses (if applicable):* HCS 100, 103.

Students must successfully complete all courses for which they have registered in any one semester before advancing to the next semester (except students in the second year who have received an *IP* for work in progress). At the discretion of the program director, a student who fails to complete a course satisfactorily may be dismissed from the program. Students whose academic performance falls below average in any course may be required to take additional courses or to complete remedial work before continuing in the program.

### Residence Requirement

Generally, a minimum of 75 semester hours in the preclinical and clinical portions of the major must be completed in residence at the School of Medicine and Health Sciences. Under special circumstances, exceptions to the minimum residence requirement may be allowed.

### Applications

Application forms for the on-campus program are available from the Physician Assistant Program, Himmelfarb 307, 2300 I Street, N.W., Washington, D.C. 20037, beginning in July. A part-time option is available for students who must work full time. Interested applicants should contact the program director.

### Off-Campus Military Program

Military students in the off-campus program must complete the following courses:  
*Human Competence.* 30 semester hours, including 6 hours in English composition and 24 hours in the humanities and social sciences.

*Subject and Vocational Competence.* 92 semester hours, consisting of the following (courses in the core curriculum are indicated by an asterisk).

*Basic Health Sciences:* HCS 111, 120, 121, 151.\*  
*Basic Clinical Sciences:* HCS 109, 127,\* 128,\* 129,\* 134,\* 137, 146, 147, 148.

*Clinical Clerkships:* HCS 169, 172,\* 174,\* 178,\* 189, 190, 191, 192, 195, 198.  
*Other Required Courses:* A minimum of 30 semester hours of didactic course work must be completed in the biological and physical sciences. This requirement will be satisfied by successful completion of Advanced Hospital Corps School (NEC 8425) or comparable course work.

### Radiological Sciences and Administration Program

This program is designed for registered technologists in diagnostic radiologic technology, nuclear medicine technology, ultrasound, or radiation therapy technology who wish to continue their education at the baccalaureate level.



### Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 47–51. In addition, students applying to the program must be registered technologists or registry-eligible within the first semester of study at George Washington University. Two letters of recommendation (submitted directly by previous instructors, advisors, or employers) and a personal interview are required.

### Advanced Standing

General provisions for advanced standing are listed on pages 49–50. In addition, students may receive up to 48 semester hours of credit applicable toward fulfillment of the subject competence requirements under the following conditions:

1. If their technical training was completed within the last five years and they maintained a minimum QPI of 2.5 or an average of 80% in a program accredited by the Joint Review Committee on Educational Programs in Radiologic Technology, Diagnostic Ultrasound, Nuclear Medicine Technology, or Radiation Therapy Technology of the Council on Medical Education of the American Medical Association.
2. If they have been certified as an American registered radiologic technologist, nuclear medicine technologist, diagnostic medical sonographer, or radiation therapy technologist.
3. If they become registry-eligible during the first semester of study at George Washington University.

### Degree Requirements

The program requires satisfactory completion of 124 semester hours of course work, distributed as follows:

*Human Competence.* A minimum of 30 semester hours, including BAd 110 and 191, CpMd 101, Engl 9 or 10 and 11 or 12, Psyc 1, 6 hours of social sciences, and 6 hours of humanities. Recommended electives include Comm 111, Engl 101, Psyc 144, and Soc 124 and 129.

*Subject and Vocational Competence.* A total of 94 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association-approved program in diagnostic radiologic technology, diagnostic ultrasound, nuclear medicine technology, or radiation therapy technology. The remaining 46 semester hours consist of the following required courses, which constitute the core curriculum.

*Radiological Sciences:* Rad 130, 160, 167, 171, 175, 190, 195.

*Radiology Administration:* HSA 142, 153, 154, 170; Rad 140, 145.

*Electives:* 6 hours selected in consultation with the faculty advisor.

### Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

### Applications

Application forms are available from the Radiological Health Sciences Programs Office, 2300 I Street, N.W., Washington, D.C. 20037, and should be completed and returned no later than April 30.



## Certificate Programs

### Certificate in Medical Technology

Students who have already earned the bachelor's degree from an accredited institution and have completed course work comparable to that required in the first three years of the medical technology degree program (see above) may apply for admission to the clinical year. Upon successful completion of this program of study, they will be awarded a certificate in medical technology.

In addition to completing the application for the clinical year, applicants to the certificate program must have copies of all college transcripts sent to the director of the medical technology program. Three letters of recommendation are also required, two from science instructors and one from a faculty advisor or employer.

Applicants who have received their education from a university outside the United States must have their transcripts evaluated by one of the foreign transcript evaluation agencies. A list of acceptable evaluation agencies may be obtained from the program director. A copy of this evaluation should be sent with the other required documents.

### Certificate in Nuclear Medicine Technology

Admission to the certificate program in nuclear medicine technology is open to students who hold associate's or bachelor's degrees and have completed college-level course work in anatomy and physiology, general chemistry, and general physics as well as 6 semester hours of English composition. The program requires satisfactory completion of at least 39 semester hours of course work, including Rad 10, 43, 44-45-46, 55-56, 59, 66, 72, 73, 74, 130, and 190.

Application forms for the certificate program are available from the Radiological Health Sciences Programs Office, 2300 I Street, N.W., Washington, D.C. 20037. The deadline for return of completed applications is April 30.

### Nurse Practitioner Certificate

#### Admission Requirements

To be considered for admission to the nurse practitioner certificate program, an applicant must (1) have a B.S.N. or M.S.N. from an accredited school of nursing, (2) have a grade-point average of 2.5 (out of 4.0) from the B.S.N. or M.S.N. degree program, and (3) have practiced nursing during the two-year period before seeking admission to the program.

Three letters of recommendation must be sent directly from evaluators. At least one must be from a supervisor; the remainder may be submitted by present or former instructors or by colleagues familiar with the applicant's health care experience.

#### Program Requirements

Students must successfully complete the following courses to be eligible to take the American Nurses Association's Adult Nurse Practitioner certification examination: HCS 125, 140, 143, 144, 175, and Phar 158

Students must also complete a 450-hour preceptorship that has been individually designed from the following courses: HCS 153, 154, 157, 165, 170, and 177



In addition, students who wish to take the American Nurses Association's Gerontologic Nurse Practitioner certification examination may elect the following courses in gerontology:

HCS 193 and either Gern 201 or Soc 280 and HCS 154 (as part of the 450-hour preceptorship)

The courses for the adult and gerontologic nurse practitioner certificate may be taken on a full-time or part-time basis.

### Applications

Application materials are available from and should be returned to the Nurse Practitioner Program, Himmelfarb 303, 2300 I Street, N.W., Washington, D.C. 20037. The program sequence begins in January.

### Physician Assistant Certificate

The post-baccalaureate program leading to the physician assistant certificate is available only to those students who are also pursuing the Master of Public Health degree (see page 40). To be considered for admission to this component of the joint Physician Assistant-M.P.H. program, applicants must have a bachelor's degree from an accredited college or university and must meet the requirements for admission to degree candidacy in the physician assistant program (see above). The program of studies for the certificate consists of those courses needed to fulfill the subject and vocational competence requirements of the degree program. Application forms for the joint program are available from the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences, Box 32, 2300 I Street, N.W., Washington, D.C. 20037.

### Certificate in Radiation Therapy Technology

Admission to the certificate program in radiation therapy technology is open to ARRT-registered or registry-eligible graduates of an accredited radiologic technology program. Nurses and other health sciences professionals are also eligible for admission if they have taken relevant physics courses prior to application. The program requires satisfactory completion of at least 37 semester hours of course work, including Rad 11, 12, 16-17-18, 19, 20-21, 23 (9 hours), 24, 25, 130, and 190.

Application forms for the certificate program are available from the Radiological Health Sciences Programs Office, 2300 I Street, N.W., Washington, D.C. 20037. The deadline for return of completed applications is April 30.

### Courses Offered by Other Divisions of the University

Students should consult their academic advisors for information about required courses that are offered by Columbian College of Arts and Sciences or by the School of Government and Business Administration. The program coordinators in the Office of Health Sciences Programs Administration will provide assistance in choosing electives appropriate for the student's program. These may be selected from a range of offerings in the humanities, mathematics, and social sciences; see the University's *Undergraduate and Graduate Programs Bulletin* for complete course descriptions.

Off-campus students should consult the appropriate program coordinator for assistance in selecting electives and required courses at other institutions.











## Courses of Instruction

Courses are subject to change. The University reserves the right to withdraw any course announced. The staff of instruction listed by department at the back of this *Bulletin* is current as of January 1989.

### Explanation of Course Numbers and Symbols

Courses numbered 1-200 are for students in undergraduate health sciences programs. Courses in the basic science departments numbered 201-400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered from 201 to the 800s are primarily for candidates for the M.D. degree unless otherwise stated.

A number in parentheses after the name of the course indicates the number of semester hours of credit that may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

### Key to Abbreviations

The following abbreviations are used for course designations.

Accy	Accountancy	ExSA	Exercise and Sport Activities
AdSc	Administrative Sciences	ForS	Forensic Sciences
AHA	Allied Health Administration	Fren	French
AM	Association Management	Geog	Geography and Regional Science
AmCv	American Civilization	Geol	Geology
Anat	Anatomy	Ger	Germanic Languages and Literatures
Anes	Anesthesiology	Gern	Gerontology
Anth	Anthropology	Gnet	Genetics
ApSc	Applied Science	HCS	Health Care Sciences
Art	Art	Hist	History
ArTh	Art Therapy	HmKn	Human Kinetics
BA	Business Administration	Hmn	Humanities
Bioc	Biochemistry and Molecular Biology	HmSr	Human Services
BiSc	Biological Sciences	HRD	Human Resource Development
CE	Civil Engineering	HSA	Health Services Administration
Chem	Chemistry	IAff	International Affairs
Chin	Chinese	Idis	Interdisciplinary Courses
Clas	Classics	Ital	Italian
ClEn	Clinical Engineering	Japn	Japanese
Cnsl	Counseling	Jour	Journalism
Comm	Communication	Kor	Korean
CpMd	Computer Medicine	Law	Law
CSci	Computer Science	Libr	Library
Derm	Dermatology	Math	Mathematics
EAd	Engineering Administration	ME	Mechanical Engineering
Econ	Economics	Med	Medicine
Educ	Educational Leadership	Mgt	Management Science
EE	Electrical Engineering	Micr	Microbiology
EFL	English as a Foreign Language	MStd	Museum Studies
EMed	Emergency Medicine	Mus	Music
Engl	English	Neur	Neurology
EngS	Engineering Science	NSc	Naval Science
EnHe	Environmental Health	NSur	Neurological Surgery
Envr	Environmental Studies		
E&RP	Environmental and Resource Policy		



Ob&G	Obstetrics and Gynecology
Opht	Ophthalmology
OR	Operations Research
Orth	Orthopaedic Surgery
PA	Public Administration
Path	Pathology
Pchi	Psychiatry and Behavioral Sciences
PCm	Political Communications
Peds	Pediatrics
Phar	Pharmacology
Phil	Philosophy
Phyl	Physiology
Phys	Physics
Port	Portuguese
PPol	Public Policy
PSc	Political Science
Psyc	Psychology
PubH	Public Health
Rad	Radiology
Rel	Religion

Rmn	Romanian
Rom	Romance Literatures
Slav	Slavic Languages and Literatures
SLP	Service-Learning Program
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpHr	Speech and Hearing
Stat	Statistics/Computer and Information Systems
Surg	Surgery
TCom	Telecommunication
TrDa	Theatre and Dance
TrEd	Teacher Education
T&T	Travel and Tourism
Univ	University
Urol	Urology
U&RP	Urban and Regional Planning
WStu	Women's Studies

### Allied Health Administration

Courses numbered 100–180 (except AHA 110, 125, and 135) are open only to degree candidates in the medical record administration program.

- 110 **Health Care Organization (3)**  
Introduction to the organization of health care delivery in the United States, with emphasis on the structural aspects of resources available to, and problems encountered in, the present health care system. (Fall) Date
- 120 **Managing Health Information Services (3)**  
Lecture (2 hours), laboratory (2 hours). Introduction to management principles as applied to the planning, development, organization, coordination, and evaluation of information services for health care facilities and related agencies. Date
- 125 **Financial Concepts for Health Care Managers (3)**  
Introduction to financial and accounting concepts related to health care management. Review of reimbursement and documentation issues. (Fall) Date
- 135 **Quality Assurance for Health Care Managers (3)**  
Lecture (2 hours), laboratory (2 hours). Development, implementation, coordination, and evaluation of quality assurance systems, including utilization management, quality assessment, risk management, and peer review. Date
- 140 **Computer Applications in Health Information Management (3)**  
Lecture (2 hours), laboratory (2 hours). Application of concepts and techniques of systems analysis to the management of health information services, with emphasis on the development, implementation, and evaluation of computer-based information systems. Date
- 150 **Professional Standards in Health Record Administration (3)**  
Study of the standards of professional practice used to evaluate health record management and maintain the integrity of record systems. Date
- 170 **Management Practicum in Health Information Systems (3)**  
Supervised placement for a minimum of four weeks in the medical record department of an accredited health care facility. Concurrent registration: AHA 176. Date
- 175 **Health, Education, and Rehabilitation Networks (3)**  
Survey of the roles and relationships of selected health care, special education, and rehabilitation services. Topics include philosophical foundations, current legislation, and societal concerns as they relate to the professions. Date
- 176 **Seminar: Management of Health Information Systems (2)**  
Consideration of current topics in health information management, including discussion and evaluation of clinical experience. Concurrent registration: AHA 170. Date



## 199 Independent Study (3)

Student determines the area of study and develops learning objectives in conjunction with the faculty advisor.

Staff

**Anatomy**

Acting Chair F. D. Allan

- 115 **Anatomy for Health Sciences Students** (4) Staff  
Gross and microscopic structure of the human body, including musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, and reproductive systems. Laboratory work is limited to prosected anatomical demonstrations.
- 202 **Gross Anatomy** (6) Slaby and Staff  
For graduate students. Regional dissections of adult cadaver supplemented with lectures and X-rays. Laboratory fee, \$30. (Fall)
- 203 **Human Developmental Anatomy** (1) K. Johnson  
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)
- 204 **Neuroanatomy** (2) Peusner  
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, \$13. (Fall)
- 205 **Human Microscopic Anatomy** (3) Koering and Staff  
For graduate students. Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, \$20. (Fall)
- 208 **Comparative Vertebrate Neurology** (1) T. Johnson  
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, \$10. (Spring)
- 209 **Use of Audiovisual Techniques in Anatomy** (2) Allan  
For graduate students. Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, \$20. (Spring)
- 212 **Neurobiology** (3) Staff  
For graduate students. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Same as Idis/Phyl 212. Laboratory fee, \$25.
- 213 **Gross Anatomy** (6) Staff  
Required for medical students. (Fall)
- 214 **Microscopic Anatomy** (3) Staff  
Required for medical students. (Fall)
- 215 **Human Developmental Anatomy** (1) Staff  
Required for medical students. (Fall)
- 221-22 **Seminar** (1-1) Walsh  
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and students. Medical students encouraged to attend. (Academic year)
- 249 **Introduction to Anatomical Research** (1) Staff  
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)
- 252 **Physical Anthropology** (1) Ubelaker  
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient humans. (Spring)
- 253 **Brain-Tissue Interactions** (1) Walsh and Rosenstein  
Interactions of the central nervous system with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Anat/Idis/Phyl 212. (Spring)
- 254 **Fetal Anatomy** (2) Allan  
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring)



- 260 **Electron Microscopy in Cellular Biology—Lecture** (1)  
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring) Koering
- 261 **Electron Microscopy in Cellular Biology—Laboratory** (4)  
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, \$25. (Spring) Koering
- 262 **Gross Anatomy of Upper and Lower Extremities** (2)  
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring) Staff
- 264 **Gross Anatomy of Head and Neck** (2)  
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring) Staff
- 265 **Clinical Cell Biology and Electron Microscopy** (arr.)  
Investigation of clinical problems concerning microwave effects on the nervous system. Four-week elective periods. (Spring) Albert
- 266 **Gross Anatomy of Thorax and Abdomen** (2)  
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring) Staff
- 268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2)  
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring) Staff
- 270 **Dissection of the Human Brain** (1)  
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, \$10. (Spring) T. Johnson
- 272 **Autonomic Nervous System** (1)  
Development, microscopic and gross anatomy, and function of central and peripheral components of autonomic nervous system. (Spring) Allan
- 275 **Advanced Human Embryology** (2)  
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring) Staff
- 276 **Advanced Studies in Anatomy** (1)  
Lectures and conferences on selected anatomical subspecialties—endocrinology; teratology, growth, and others. May be repeated for credit. (Spring) Staff
- 279 **Applied Regional Anatomy** (arr.)  
Regional dissection, assigned reading, discussions. (Spring) T. Johnson and Staff
- 282 **Advanced Neuroanatomy** (arr.)  
Dissection of the human brain, study of slides of the central nervous system; introduction to neurological research. (Spring) Staff
- 284 **Applied Surface Anatomy and Radiology** (5)  
Detailed study of anatomical structures that are accessible to examination in the living subject; normal radiology of the body. Four-week elective periods. (Spring) Slaby
- 288 **Surface Anatomy and Radiology** (1)  
Lectures on areas of clinical importance. (Spring) Slaby
- 289 **Biochemical and Morphological Techniques in Cell Biology** (3)  
Application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment. (Spring) Staff
- 291 **Special Projects in Anatomy** (arr.)  
Independent study of any aspect of gross anatomy. (Spring) Staff
- 295 **Research** (arr.)  
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring) Staff
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Staff



- 501 **Didactic Anatomy (3)** Staff  
Development of a didactic program to include human developmental anatomy, microscopic anatomy, gross anatomy, and where appropriate, neuroanatomy. May also include interdepartmental study. Topics may include anatomy of the special senses; functional morphology of the endocrine system; structure and functional anatomy of the mammary gland at different ages in both sexes; functional anatomy of the respiratory system, including a study of the bronchopulmonary segments; the urinary system; the heart; the autonomic nervous system; the lymphatic system; the female or male reproductive system; peripheral nerves and peripheral nerve lesions; functional anatomy of bones and joints; the pregnant uterus; the structural and functional anatomy of the stomach, duodenum, and colon.
- 800 **Summer Remedial: Gross Anatomy (6)** Staff
- 801 **Summer Remedial: Microscopic Anatomy (3)** Staff
- 802 **Summer Remedial: Human Developmental Anatomy (1)** Staff

## Anesthesiology

Chair B. S. Epstein

Courses numbered 190-198 are open only to degree candidates in the nursing anesthesia program.

- 190 **Seminar: Anesthesiology (4)** Staff  
Discussion of morbidity and mortality based on actual and reported cases. Topics related to complications of anesthesia.
- 191 **Respiratory Care (3)** Staff  
Advanced techniques for the care of patients requiring total respiratory support. Same as Phar 191.
- 192 **Orientation for Anesthesia (0)** Staff  
History of anesthesia, legal aspects, ethics, psychology, professional conduct, department management, organization.
- 193-94 **Methods and Procedures in Anesthesia (2-2)** Staff  
At affiliated hospitals. Anesthesia techniques, types of anesthetic required to meet the needs of different surgical specialties, and related topics.
- 195-96 **Principles of Clinical Anesthesia (13-13)** Staff  
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows patients throughout hospitalization. Designed to satisfy the requirements of the American Association of Nurse Anesthetists.
- 198 **Pathological Physiology and Anesthesia (3)** Staff  
Review of pathophysiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.
- 210 **Cardiovascular Research in Anesthesia (5)** Mergner  
Experience in and observation of the various aspects of laboratory research in anesthesia, particularly research on regional myocardial ischemia in the dog.
- 211 **Diagnostic and Therapeutic Instrumentation (2)** Shaffer  
Introduction to diagnostic and therapeutic instrumentation used in critical care areas of the hospital, including the OR, ICU, CCU, and ICN. Methods of operation, problems, and new developments in instrumentation.
- 212 **Anesthesiology Research Laboratory (2)** Mergner  
Cardiovascular physiologic changes and measurements resulting from drugs, drug interactions, and anesthetic techniques. Placental transfer and fetal and maternal physiologic changes from toxic local anesthetic reactions. Limited enrollment. Second year only.
- 302 **Required Anesthesiology (3)** Morales and Staff  
Required for senior medical students. Basic physiology and pharmacology as applied to cardiac, respiratory, obstetric, and renal changes incurred during anesthesia. Clinical applications are discussed and demonstrated.



- 380 **Anesthesiology (5)**  
Clinical experience in preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, and monitoring and blood gas determinations. Four-week elective periods. University Hospital. *Morales*
- 382 **Neurosurgical Anesthesia (arr.)**  
Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Monitoring of somatosensory, visual, and auditory evoked responses and intracranial pressure. Effects of respiratory nursing and physiotherapy maneuvers on neurosurgical patients. Participation in research projects in operating room and intensive care unit may be possible. University Hospital. *Lee*
- 384 **Intensive Care Unit (5)**  
Evaluation and management of respiratory failure, rationale and use of ventilators, airway management, cardiovascular support, and intensive care. Four-week elective periods. University Hospital. *Zimmerman and Staff*
- 386 **Critical Care Medicine (arr.)**  
Experience in managing patients with renal failure, shock, respiratory failure, acid-base disorders, and hyperalimentation, with emphasis on appropriate use of invasive monitoring, intubation, and ventilatory support. *Rainey and Staff*
- 387 **Critical Care Medicine Research (arr.)**  
Investigation of pathophysiologic mechanisms involved in the metabolic and cardiopulmonary alterations of critical illness that may lead to development of new pharmacologic agents useful in treating critically ill patients. May include clinical research, animal research, or bench laboratory investigation. National Naval Medical Center. *Rainey*
- 390-92 **Extramural Anesthesiology Elective (arr.)**  
Elective periods at other institutions.

## Biochemistry and Molecular Biology

*Chair A. L. Goldstein*

- 101 **Chemistry for Health Sciences Students (2)**  
For students in health sciences programs. Basic concepts of general and organic chemistry. (Fall) *Staff*
- 111 **Biochemistry for Health Sciences Students (4)**  
For students in health sciences programs. Basic concepts of biochemistry and their relation to the allied health field. (Fall) *Walker*
- 201 **Medical Biochemistry (8)**  
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine. (Fall) *Walker and Staff*
- 209 **Research Elective in Medical Biochemistry (arr.)**  
For senior medical students. Research in areas currently under investigation in the department. (Academic year) *Walker*
- 221-22 **General Biochemistry (4-4)**  
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year) *Gallo and Staff*
- 223 **Physical Biochemistry (3)**  
Lectures cover basic laboratory techniques used in contemporary biochemical and molecular biological research. (Fall) *Vanderhoek*
- 225-26 **Introduction to Biochemical Research (arr.)**  
Rotation through research projects in laboratory units within the biochemistry department to provide individualized in-depth training in the methods and instrumentation used. Limited to graduate students in the department. (Academic year) *Fiskum and Staff*
- 227 **Biochemistry Seminar (1)**  
Current literature in biochemistry. Enrollment limited to graduate students in the department. May be repeated for credit. (Fall and spring) *Staff*



- 230 **Current Topics in Enzymology** (2) Bailey and Staff  
Directed readings in various areas of enzymology. May be repeated for credit.  
Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.
- 231 **Bioenergetics** (2) Staff  
Biochemical thermodynamics, oxidation-reduction processes, oxidative phosphorylation, photosynthesis, and chemiosmotic energy coupling. Prerequisite: Bioc 201 or 221-22. (Fall)
- 240 **Nutrition** (2) Walker and Staff  
Discussion of RDA, nitrogen balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221-22. (Spring)
- 260 **Biochemistry of Lipids and Membranes** (2) Vanderhoek  
For graduate students. Biochemistry, structures, and function of various lipid classes, membranes, and receptors. Prerequisite: Bioc 221-22. (Spring)
- 261 **Current Topics in Lipids** (1 or 2) Staff  
Directed readings in the area of lipid biochemistry. May be repeated for credit.  
Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 260.
- 264 **Membrane-Associated Complex Lipids** (1) Fishman  
Catabolism and biosynthesis of complex sphingolipids, inherited metabolic diseases associated with abnormal sphingolipid metabolism, membrane receptors for toxins and hormones, and other special topics. Prerequisite: Bioc 221-22. (Spring)
- 270 **Biochemistry and Cell Biology of the Immune Response** (2) Naylor and Staff  
Biochemical aspects of the immune response at the molecular and cellular level. Modern experimental approaches to immunology and cell biology. Prerequisite: Bioc 221-22 and Micr 229, or permission of instructor. (Spring)
- 271 **Current Topics in Immunology** (1 or 2) Goldstein and Staff  
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 270.
- 280 **Neurochemistry** (2) Moody and Staff  
Molecular structure and function of nerve tissue, intra- and interneuronal communication mechanisms, biochemistry of various brain dysfunctions, and other special topics. Prerequisite: Bioc 201 or 221-22. (Fall)
- 290-91 **Extramural Biochemistry Elective** (arr.)  
Elective periods at other institutions.
- 295 **Research in Biochemistry** (arr.) Staff  
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered. May be repeated for credit. (Fall and spring)
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)
- 501 **Readings in Human Nutrition** (arr.) Walker  
For senior medical students. Directed readings in human nutrition. Review of basic concepts of nutrition and their application to clinical situations. (Spring)
- 503 **Readings in Immunology** (3) Goldstein  
Directed readings in immunochemistry, immunobiology, tumor immunology, and basic and clinical cellular immunology. May be repeated for credit. (Spring)
- 800 **Summer Remedial: Biochemistry** (8)



## Computer Medicine

Chair W. S. Yamamoto

- 101 **Practical Computing for Health Sciences Students** (3)  
Introduction to computer technology for students with no previous background in computers or data communications. Lecture and laboratory. Orthner
- 201 **Theory of Medicine** (1)  
Theoretical constructs implicit in the practice of medicine, with emphasis on decision theory. Other topics include the nature, origin, and organization of medical knowledge, focusing on statistical reasoning. Yamamoto
- 252 **Introduction to Interactive Computing** (1)  
Introduction to PC-based interactive computing and software packages for applications such as word processing, spreadsheets, database management, telecommunications, and electronic mail. Basic elements of computer programming. Successful completion of this course will satisfy the medical computing competency requirements for first- and second-year medical students. Enrollment limited. Open to non-medical students with permission of instructor. Orthner and Staff
- 253 **Medical Computing** (1)  
Aspects of computer use, including preparation and execution of programs that involve clinical or research applications, such as ECG analysis, medical file management, mathematical modeling, and managerial computing. Yamamoto
- 353 **Medical Computing** (arr.)  
For senior medical students. Aspects of computer use, including preparation and execution of programs that involve clinical or research applications, such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. Tutorial or classroom instruction, depending on enrollment. Yamamoto, Orthner
- 354 **Automated Medical Measurement Systems** (5)  
Students work under supervision in a multiphasic screening clinic and participate in implementation and evaluation of the system. Seminar discussions related to clinical practice, preventive medicine, and occupational medicine. Four-week elective periods. Warwick Building. Tidball
- 390-91 **Extramural Computer Medicine Elective** (arr.)  
Elective periods at other institutions. Yamamoto
- 502 **Mathematical Models and Decision Theory** (3)  
For senior medical students. Systematic review of mathematical and computational approaches to medical decision analysis and representations of biomedical information. Models deal with physiological systems in heuristic and decision algorithms and with formulation of medical information for automated diagnosis and prognosis. Students should have some background in probability and differential equations and must complete a project involving computers. Warwick Building. Elgart and Staff

## Dermatology

Chair M. L. Elgart

- 380 **Dermatology Clinic** (5)  
Conferences, lectures, and attendance at dermatology clinic. Diagnosis and treatment of common skin disorders, dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. Four-week elective periods. Medical Faculty Associates. Mitchell
- 381 **Dermatology Clinic** (5)  
Same as Derm 380. Four-week elective periods. Group Health Association. James and Staff
- 382 **Dermatology Clinic** (5)  
Same as Derm 380. Four-week elective periods. Walter Reed Army Medical Center.



- 383 **Dermatology Clinic** (arr.) Ruggles  
Same as Derm 380. Four-week elective periods. Andrews AFB Hospital.
- 385 **Dermatology in General Medicine** (arr.) Nigra and Staff  
Outpatient clinic two mornings a week, daily rounds on the inpatient and consultation services, consultations on all patients in hospital. Basic science conference and at least three hours of dermatology review slide sessions each week. Advanced readings in dermatology. Supervision by chief resident. Washington Hospital Center.
- 386 **Private Office Practice** (arr.) Elgart  
The department arranges for students to work in a private dermatology practice.
- 390-92 **Extramural Dermatology Elective** (arr.)  
Elective periods at other institutions.

## Emergency Medicine

Chair M. S. Smith

- 10 **Introduction to Prehospital Clinical Medicine** (5) Warner, Luedtke  
Explores, through lectures and simulation exercises, the role and responsibilities of the emergency medical technician/ambulance (EMT/A). Patient assessment, basic life support, hemorrhage control, bandaging, splinting, and extrication techniques. Observation of emergency care delivery in a local setting. Certification training in cardiopulmonary resuscitation. Upon successful completion, the student is eligible to take the national registry EMT/A examination.
- 11 **EMT/A Review** (2) DeAtley, Luedtke  
Review of information and skills for the emergency medical technician preparing to take a state recertification examination. Includes CPR certification, EOA, and MAST training. Prerequisite: current EMT/A certification and EMed 10 or equivalent.
- 12 **Preliminary Emergency Care** (2) Staff  
Classroom and laboratory instruction that follows the Department of Transportation's first-responder course guidelines. Topics include airway management, CPR, hemorrhage control, bandaging, and splinting. Upon successful completion, the student is eligible to take a state first-responder certification examination.
- 13 **First-Responder Review** (2) Staff  
Review of information and skills for the first-responder preparing to take a state recertification examination. Includes CPR certification. Prerequisite: current first-responder certification and EMed 12 or equivalent.
- 18 **Emergency Medical Services and the Health Care System** (3) Schottke  
Organization and management of emergency medical services systems. Service delivery methods, the relationship of emergency medical services to the overall health care system, and the roles of federal, state, and local governments and the private sector in delivery of emergency care. Prerequisite: EMed 180 or equivalent.
- 20 **Management Communication Skills** (3) DeAtley  
Development of skills in report and proposal writing, record keeping, and oral presentation.
- 30 **Design of Emergency Medical Services Communication Systems** (3) Schottke  
Introduction to communication networks in the emergency medical services system, including communication systems design, dispatch protocols, triage, and procedures for multiple-casualty incidents.
- 40 **Management of Emergency Services** (3) Schottke  
Principles of personnel management and processes that contribute to the effectiveness of an organization. Topics include manpower training and use, resource allocation, vehicular design, and equipment purchase.
- 50 **Health and Safety Legislation** (3) Schottke  
Survey of the methods used to develop health and safety legislation, including the roles of federal, state, and local governments. Implications of such legislation for industry, the medical community, and the public.



- 55 **Legal Aspects of Emergency Management (3)**  
Legal issues in the delivery of emergency medical services, including abandonment, malpractice, negligence, patient consent, the Freedom of Information and Privacy Acts, the Good Samaritan law, protocol deviation, record keeping, patient refusal of services, and medical control. Emergency medicine legislation and recent court decisions. DeAtley
- 61 **Prehospital Advanced Life Support I (5)**  
Role and responsibilities of the emergency medical technician/paramedic, including medical history and physical assessment techniques, pathophysiology, and management of shock, cardiac, respiratory, neurological, and abdominal emergencies. Overview of emergency medical services communication systems. Students are assigned to work in local emergency departments and ride with area paramedics. Laboratory sessions in patient assessment, advanced airway management, defibrillation, intravenous techniques, and IM/SQ injections. Prerequisite: EMed 10; concurrent registration: EMed 65. Staff
- 62 **Prehospital Advanced Life Support II (5)**  
Assessment and management of emergencies in obstetrics, gynecology, trauma, pediatrics, adolescent medicine, and geriatrics. Prerequisite: EMed 10; concurrent registration: EMed 66. Staff
- 63 **Paramedic Skills I (1)**  
Presentation of trauma management skills outlined in PHILS/BTLS course. Prerequisite: permission of instructor. Staff
- 64 **Paramedic Skills II (1)**  
Presentation of cardiac emergency management skills outlined in the American Heart Association's ACLS course. Lecture and laboratory. Prerequisite: permission of instructor. Staff
- 65 **Prehospital Clinical Practicum I (9)**  
Students rotate through a variety of clinical sites, including critical care units, operating rooms, renal dialysis departments, and mobile intensive care units. Concurrent registration: EMed 61. Staff
- 66 **Prehospital Clinical Practicum II (9)**  
Students rotate through a variety of clinical sites, including critical care units, burn units, labor and delivery rooms, and mobile intensive care units. Concurrent registration: EMed 62. Staff
- 67 **Extrication and Rescue Techniques (3)**  
Techniques used in gaining access to and evacuating the injured. Vehicular accident extrication, high-rise and water rescue, electrical emergencies, and use of ropes. Warner
- 68 **Arrhythmia Recognition for Emergency Clinicians (1)**  
Fundamentals of electrocardiography and interpretation of basic ECG patterns. Common errors in taking and reading ECGs, with emphasis on identification of normal and abnormal wave patterns. Effects of drugs and electrolyte imbalance on ECG patterns. DeAtley
- 100 **Educational Planning and Assessment for Emergency Managers (3)**  
Theories and principles of learning and teaching, including development of effective course objectives, lecture outlines, and examinations. Schotke
- 110 **Stress Management (3)**  
Impact of stress and burnout on emergency personnel. Causes and effects of stress. Short-term stress counseling techniques, effective coping mechanisms, and time management skills. Staff
- 115 **Emergency Management Information Systems (3)**  
Introduction to the use and application of microcomputers in emergency medical services. Basic programming concepts, comparison of computer-assisted systems. Use of microcomputers in inventory control, performance evaluation, and resource allocation. Prerequisite: Educ 180 or equivalent. Staff
- 140 **Analysis of Emergency Medical Services Systems (3)**  
Planning and evaluation of emergency medical services, using various analytical models to examine the components of an emergency medical services system. Prerequisite: EMed 40; concurrent registration: HSA 170. DeAtley
- 150 **Disaster Management and Planning (3)**  
Planning for and management of multiple-casualty incidents in the prehospital and hospital environment, including development of response plans, triage, medical



- evacuation procedures, communications, roles of government and the private sector, terrorism, and medical care for mass gatherings.
- 151 **Medical Management of Hazardous-Materials Incidents (3)** DeAtley  
Hazardous materials and their risks. Identification of hazardous materials and related problems, precautions in approaching the contaminated patient, protective clothing, decontamination, and management of selected hazards. Prerequisite: EMed 10 or equivalent.
- 170 **Introduction to Safety and Occupational Health (3)** Staff  
Overview of the safety movement. Economic impact of accident-related losses and methods of reducing such losses. Roles of safety and occupational health in minimizing risks and losses.
- 171 **Environmental Aspects of Safety and Occupational Health (3)** Staff  
Health and safety concerns related to workplaces and equipment. Examination of environmental conditions conducive to accidents and methods for monitoring these conditions.
- 172 **Accident Prevention (3)** Staff  
Overview of accident prevention and loss control. Introduction to comprehensive safety concepts and methodology. Prerequisite: EMed 170.
- 173 **Assessment of Accident Risks (3)** Staff  
Methods of obtaining, recording, and analyzing information related to causes of accidents in the community. Prerequisite: EMed 170, 171, 172.
- 180 **Leadership Skills (3)** DeAtley  
Development of skills in listening, delegation of responsibilities, discipline, and decision making.
- 181 **Integrated Emergency Management (3)** Staff  
Identification of agencies involved in disaster response and development of an integrated emergency management system. Prerequisite: EMed 150.
- 182 **Public Education and Media Relations (3)** Staff  
The role of the media in emergency medical services explored through classroom discussion with media representatives. Advantages and disadvantages of media coverage. Methodologies for public education about emergency medical services.
- 183 **Office Management (2)** Staff  
Setup and management of an office, including establishment of filing systems, selection of office equipment, communication techniques, public relations, and marketing.
- 185 **Emergency Management Research Design (3)** Staff  
Basic principles and methods of data collection, analysis, and reporting. A research project is required. Prerequisite: EMed 18; concurrent registration: Stat 51.
- 190 **Seminar: Advanced Topics in Emergency Management (3)** Staff  
Management issues, such as labor relations, collective bargaining, contract negotiation, financing, and formulation of public policy. Prerequisite: permission of instructor.
- 199 **Independent Study (3)** Staff  
Individual research project in an area relevant to emergency medicine. For undergraduate seniors with permission of program faculty.
- 200 **Emergency Management Administrative Internship (13)** DeAtley  
The student is assigned to a local emergency medical service agency to assist in the administration of its health care delivery program. Opportunity to evaluate health care service delivery and to devise protocols and regulations.
- 201 **Cardiopulmonary Resuscitation Practicum (0)** DeAtley and Staff  
Mechanical skills for providing basic cardiac life support (BCLS). Upon completion of EMed 201 and 230, the student receives BCLS certification.
- 230 **Emergency Medicine I (2)** DeAtley, Scott  
Required course for first-year medical students. Lectures, demonstrations, and practice sessions on basic prehospital assessment and stabilization. Upon completion of EMed 201 and 230, the student receives BCLS certification.
- 231 **Emergency Medicine II (1)** DeAtley and Staff  
Elective supplement to and expansion of EMed 230. The student is expected to develop proficiency equivalent to that of an emergency medical technician. Oppor-



- tunities to spend time on a basic life support ambulance or a mobile intensive care unit. The student will receive BCLS certification after successful completion of the course. Prerequisite: EMed 230.
- 302 **Emergency Medicine (3)** Scott and Staff  
Required for senior medical students. Rotating clinical shifts in the emergency unit of the University Hospital under supervision of the faculty and residents of the Department of Emergency Medicine. Videotaped lectures, daily student conferences, and required readings. Two-week rotation with ten required clinical shifts. M. Smith
- 311 **Emergency Medicine (arr.)**  
Two- or four-week elective in emergency medicine in a suburban community hospital. Participation in relevant conferences at Holy Cross and the weekly emergency medicine grand rounds series. Prerequisite: EMed 302. Holy Cross Hospital. Scott
- 312 **Emergency Medicine Elective (arr.)**  
Four-week elective for the student interested in emergency medicine as a career. The student is assigned a faculty preceptor and combines clinical experience with a research or administrative project. Prerequisite: EMed 302. Adams, Chen
- 320 **Comparative Emergency Medical Services Systems (arr.)**  
Time is divided among EMS systems in the District of Columbia, Montgomery County, and Fairfax County. The student accompanies prehospital advanced life support providers and must complete assigned readings and a short written report on a prehospital care topic. Prerequisite: permission of instructor and, for visiting students, EMed 302 or equivalent. J. Smith
- 330 **Clinical Toxicology (5)**  
Under supervision, students work in the National Capital Poison Control Center at Georgetown University Hospital, responding to requests for information from the public and medical community. Also includes a series of seminars. Four weeks only. Prerequisite: EMed 302 and permission of instructor. Rosenthal
- 340 **Research Elective in Emergency Medicine (5)**  
Participation in ongoing research activities of the Department of Emergency Medicine. Peterson
- 350 **Wound Management (arr.)**  
Wound care, including preparation, cleansing, debridement, anesthesia, repair, dressings, splints, and after-care instruction, under the supervision of emergency department staff. Two or four weeks.
- 390-93 **Extramural Emergency Medicine (arr.)**  
Elective periods at other institutions.

## Health Care Sciences

*Acting Chair* L. G. Pawlson

Courses numbered 10 to 96 are open only to military personnel in off-campus health sciences programs.

- 10 **Anatomy and Physiology (3)**  
Study of the human body. Etiology, arthrology, myology, hematology, immunology, circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems. Staff
- 11 **Applied Anatomy and Physiology (4)**  
Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain. Physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth. Staff
- 12 **Mathematics for Health Providers (2)**  
Provides a basis for understanding the equations used to calculate the effect of undersea pressure on the human body and the information necessary to apply these calculations to appropriate therapy, such as drug dosage and other modes of treatment. Staff



- 15 **Pharmacology and Toxicology** (arr.) Staff  
Pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.
- 16 **Clinical Laboratory Techniques and Procedures** (arr.) Staff  
Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.
- 20 **Radiation Biology** (2) Staff  
Effects of ionizing radiation on various cells, tissues, organs, and the human body as an integrated unit. Organic and inorganic molecules; the human immune system; possible genetic effects and long- and short-term effects of radiation. History and use of radiation therapy, including therapy modalities, classification of neoplasms, types of therapy units, and treatments.
- 21 **Health Physics** (4) Staff  
Concepts of radioactivity, including beta decay, isometric transmissions, electron capture, internal transition, alpha decay, the auger effect, isotopic half-life, secular and transient equilibrium, artificial transmutations, nuclear reactions, and counting of statistics.
- 22 **Introduction to Epidemiology** (1) Staff  
Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of communicable diseases.
- 25 **Management of Medical and Surgical Emergencies** (7) Staff  
Basic techniques used in treating life-threatening situations. Clinical procedures include cardiopulmonary resuscitation, hemorrhage control, minor surgical procedures, and venous cutdowns. Dealing with drug overdose and treatment of acute medical problems.
- 26 **Medical Diagnosis and Treatment** (arr.) Staff  
Introduction to the recognition of clinical disease states and determination of appropriate diagnostic techniques, with emphasis on advanced technology. Review of therapeutic approaches.
- 54 **Techniques in Cardiac Resuscitation** (2) Staff  
Basic cardiac life support techniques and skills needed in basic life support instruction training.
- 66 **Radiologic Fundamentals and Radiation Health** (arr.) Staff  
Basic concepts used in diagnosis of disease using radiologic equipment. Commonly used positions, degrees of X-ray penetration, protective measures for patients and technologists. Safety techniques and acceptable units of radiation exposure. Review of NRC regulations, accountability, records, receipt of materials, and storage.
- 67 **Disaster Sanitation** (3) Staff  
Survey of nuclear, biological, and chemical hazards, with emphasis on detection, protection of personnel, and related issues.
- 68 **Environmental Sanitation** (1) Staff  
Study of environmental factors that contribute to human health: food, water, living and working spaces, economics, and pest control.
- 75 **Dental Fundamentals** (2) Staff  
Overview of dental record screening, oral examination, X-ray interpretation, administration of anesthesia, and dental, endodontal, and periodontal treatment.
- 83 **Alcohol and Drug Abuse** (2) Staff  
Types and magnitude of substance abuse, ethical and medical issues, impact on the family, and treatment.
- 87 **Surface Radiation Health** (3) Staff  
Sources of radiation and radiation services and programs available in the U.S. Navy.
- 90 **Occupational and Environmental Health** (arr.) Staff  
Basic environmental hazards, such as chemical and industrial exposure. Prevention and treatment of exposure to toxic substances. On-site evaluation of safety hazards and unsafe practices in the workplace.



**92 Medical Material Management (4)**

Material management in the medical facility. Budgeting, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medications, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

**93 Health Systems Administration I (arr.)**

Health systems organization. General office procedures, standard subject identification codes, filing systems, records disposal, security of patient information, correspondence, procedural manuals.

**94 Health Systems Administration II (4)**

Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

**95 Records Management (6)**

Health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

**96 Clinical Experience (arr.)**

Supervised experience and research. Practical application of principles studied in the classroom.

**100 Clinical Medicine Review (5)**

For students in the physician assistant program who fail to meet the minimum scholarship requirement in the core curriculum by the end of the clinical year. Prerequisite: permission of program director.

**101 Environmental Biostatistics (3)**

Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students.

**102 Food and Water Sanitation (3)**

General characteristics of urban and rural water systems: treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation: processing, storing, and distributing food. Supervision and training of food industry personnel.

**103 Academic Curriculum Tutorial (arr.)**

For students in the physician assistant program who fail to meet the requirement for satisfactory performance in one or more subject areas in the first-year curriculum. Prerequisite: permission of program director.

**109 Human Behavior I (2)**

Basic knowledge of psychiatry needed to enter clinical work. Mental status examination as a tool of clinical assessment. Approaches to understanding and working with psychiatric patients. (Fall)

**113 Preventive Medicine and Epidemiology for Physician Assistants (2)**

Basic concepts of public health and epidemiology, with emphasis on those applicable to primary care practice. Topics include biostatistics and use of clinical epidemiology in interpreting medical literature. (Spring)

**115 Community Service (0)**

Introduction to community-based services in the Washington metropolitan area for students in the physician assistant program. Students volunteer at selected sites for six to eight hours each month during the last four semesters of the program. Requirements include completion of questionnaires and evaluation forms, oral presentations, and written reports.

**116 Medical Terminology (0)**

Autotutorial completed before entering the physician assistant program. Terminology and vocabulary basic to all areas of medical science, hospital service, and allied health specialties.

**119 The Physician Assistant Role in Modern Health Care (2)**

The role of physician assistants in health care delivery, with emphasis on determinants of health, organizational forces in the health care system, health policy and health financing issues, medical ethics, and legal and economic aspects of the health professions.



- 120 **Biochemistry for Health Sciences Students** (2) Staff  
Basic concepts of biochemistry and their relation to the health sciences field. For off-campus students.
- 121 **Microbiology for Health Sciences Students** (2) Staff  
Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance. For off-campus students.
- 122 **Public Health Microbiology** (3)  
Application of basic microbiology, general principles of immunology and virology, development of a surveillance protocol for nosocomial infection. For off-campus students.
- 125 **Manifestations of Disease** (5) Johnson, Stein  
Interdisciplinary course in the theory of medicine using an organ system approach. Clinical findings and pathophysiology for a wide spectrum of diseases. Diagnosis and management of diseases in a variety of medical and surgical specialties. Prerequisite: Anat 115, Phyl 111. Open to graduate students with permission of instructor.
- 126 **Clinical Approach to Diagnosis** (arr.) Staff  
Equips the student with the basic skills needed to recognize clinical symptoms and arrive at a provisional diagnosis. For off-campus students.
- 127 **Clinical Medicine I** (arr.) Staff  
Introduction to the recognition of the clinical disease state, integrating knowledge acquired in the basic sciences. For off-campus students.
- 128 **Clinical Medicine II** (arr.) Staff  
Continuation of HCS 127, with emphasis on advanced technology used in diagnosis and review of the therapeutic approach. Prerequisite: HCS 127. For off-campus students.
- 131 **Human Behavior II** (2) Staff  
Continuation of HCS 109. (Spring)
- 133 **Introduction to Clinical Assessment** (arr.) Staff  
Clinical interviewing and physical examination. The student should attain a beginner's level of clinical competence. For off-campus students.
- 134 **Clinical Assessment** (arr.) Staff  
Patient interviewing and physical examination, including integration of data obtained from the newer and more sophisticated modes of diagnostic technology. Povar
- 137 **Issues in Health Care** (1)  
Practitioner-patient interaction and the roles of law, ethics, economics, and government in the health care system.
- 140 **Clinical Decision Making** (2) Bargmann  
Methodological approach to clinical problem solving, with emphasis on interpretation of patient histories, physical examinations, laboratory results, and X-rays. Selection of appropriate pharmacological and nonpharmacological therapies. Students assist in analysis of clinical cases under faculty supervision and learn to evaluate symptoms in relation to pathophysiological changes. Open to graduate students with permission of instructor.
- 143 **Nurse Practitioner Seminar I** (2) Johnson  
Current developments in the role of the nurse practitioner, including discussion of reimbursement, nurse practice acts, liability coverage, malpractice, and role delineation.
- 144 **Nurse Practitioner Seminar II** (3) Johnson  
Health promotion and disease prevention, with emphasis on developing strategies for particular populations using an epidemiologic approach.
- 145 **Topics in Pediatrics** (1) Ettari  
Topics covered include growth and development, child safety, common respiratory infections, asthma, and abdominal disorders.
- 146 **Topics in Emergency Medicine for Physician Assistants** (1) Ettari  
Evaluation and treatment of the patient with an urgent problem. Review of signs and symptoms, accompanying physical findings, and methods for diagnosis and treatment of a spectrum of emergent illnesses. Development of skills used in the clinical year, including suturing, gowning and gloving, CPR and ACLS certification, cast application, intubation, and catheterization.



- 147 **Introduction to Radiology (1)**  
Principles and language of radiologic imaging. Radiologic anatomy. Development of a systematic approach to radiology. Normal and abnormal radiological findings. *Entai*
- 148 **Introduction to Electrocardiography (1)**  
Fundamentals of electrocardiography and interpretation of basic ECG patterns. Common errors in taking and reading ECGs, with emphasis on identification of normal and abnormal wave patterns. Effects of drugs and electrolyte imbalance on ECG patterns. *Stein*
- 153 **Gynecology Outpatient: Nurse Practitioner (arr.)**  
Elective rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting. *Adams*
- 154 **Clinical Geriatrics (arr.)**  
Required rotation for nurse practitioner students. Students develop individual study and learning objectives in conjunction with their faculty advisors. *Adams*
- 157 **Primary Care Preceptorship: Nurse Practitioner (arr.)**  
Required four-week rotation for nurse practitioner students. All aspects of patient management in ambulatory setting. *Adams*
- 158 **Cardiothoracic Medicine Elective for Physician Assistants (4)**  
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. *Staff*
- 159 **Dermatology Elective for Physician Assistants (4)**  
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. *Staff*
- 160 **Medical Inpatient (5)**  
Six-week rotation in which the student learns to collect and integrate information on the medical problems of patients who have been admitted to the hospital. The student is part of a medical team under the supervision of the medical resident or attending physician and is on regular call. Attendance is required at all work rounds, lectures, and conferences. *Alexander*
- 163 **Medical Outpatient (5)**  
Six-week rotation in which the student learns to collect and integrate information on the various medical problems encountered in the ambulatory setting, such as an outpatient clinic, an HMO, or a community health center. Emphasis on differential diagnosis, patient management, and preventive medicine. The student is part of a health care team under a physician's supervision. *Alexander*
- 165 **Medical Outpatient: Nurse Practitioner (arr.)**  
Elective rotation for nurse practitioner students, arranged with approval of advisor. Aspects of specialty patient management in ambulatory setting. *Adams*
- 166 **Surgical Inpatient (5)**  
Six-week rotation in which the student learns to collect and integrate information on admitted surgical patients and gains experience in their pre- and post-operative management. Students assist during operative and ward procedures and function as part of the surgical team under a physician's supervision. *Alexander*
- 169 **Obstetrics and Gynecology (5)**  
Six-week rotation in which the student learns to collect and integrate information on obstetrical and gynecological patients. Students assist in outpatient gynecological and inpatient obstetrical practice as part of the health care team under a physician's supervision. *Alexander*
- 170 **Obstetrics and Gynecology: Nurse Practitioner (arr.)**  
Elective rotation for nurse practitioner students. Students develop individual study and learning objectives in conjunction with their faculty advisors. *Adams*
- 171 **Pediatric Outpatient: Nurse Practitioner (arr.)**  
Elective rotation for nurse practitioner students. Ambulatory pediatric practice. *Alexander*
- 172 **Pediatric Outpatient (5)**  
Six-week rotation in which the student learns to collect and integrate information about the medical problems of the pediatric outpatient, under the direction of a *Alexander*



- pediatrician. Normal growth and development, pediatric history and physical examination, and management of common pediatric illnesses. Staff
- 174 **Primary Care (5)** Required rotation for off-campus allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians. Staff
- 175 **Primary Care Preceptorship (arr.)** Seven-week experience in which the student functions as a physician assistant in a primary care setting. Appropriate primary care areas include pediatrics, internal medicine, family practice, and emergency medicine. Staff
- 176 **Emergency Medicine Elective for Physician Assistants (4)** Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. Alexander
- 177 **General Medicine Elective for Physician Assistants (4)** Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. Alexander
- 178 **Emergency Medicine (arr.)** Rotation in which the student learns to collect and integrate information on patients in an emergency room. Experience with a variety of emergency situations through rotating shifts. The student functions as part of the emergency medical team under the supervision of a physician. Alexander
- 179 **Emergency Medicine: Nurse Practitioner (arr.)** Rotation for nurse practitioner students. Medical and surgical emergency management problems. Adams
- 180 **Practicum in Environmental Health (arr.)** Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences. Staff
- 181-82 **Introduction to Environmental Science (3-3)** General characteristics of urban and rural water systems: treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation: processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students. Staff
- 183 **Introduction to Industrial Hygiene (3)** Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and atmospheric pollution. For off-campus students. Staff
- 184 **Public Health Organization and Administration (3)** Public health activities, organization, and philosophy. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students. Staff
- 185 **Environmental Impact and the Law (3)** Rationale for environmental impact statements and government agencies responsible for these statements. Current statutes and regulations pertaining to the environment. For off-campus students. Staff
- 186 **Orthopaedics Elective for Physician Assistants (4)** Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. Alexander
- 187 **Radiology Elective for Physician Assistants (4)** Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. Alexander



- 188 **Shock Trauma Elective for Physician Assistants (4)**  
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients. Alexander
- 189 **Alcohol Rehabilitation Unit (3)**  
Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances. For off-campus students. Staff
- 190 **Dermatology (1)**  
Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students. Staff
- 191 **Eye, Ear, Nose, and Throat (3)**  
Diagnostic and therapeutic approaches to diseases of the eyes, ears, nose, and throat. For off-campus students. Staff
- 192 **Orthopaedics (3)**  
Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students. Johnson
- 193 **Clinical Aspects of Aging (2)**  
Common clinical problems of the elderly. Discussion of the demography, etiology, pathophysiology, diagnostics, and management of select problems. Health maintenance concepts. Issues concerning health policy and the aged. Staff
- 194 **Practicum in Gerontology and Geriatric Care (arr.)**  
Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. For medical students and for undergraduate and graduate students in the social sciences and health services administration. Staff
- 195 **Ophthalmology (2)**  
Recognition and management of common ophthalmologic problems. Performance of thorough ophthalmologic exams (excluding refraction) and provision of routine eye care. For off-campus students. Power
- 196 **Issues in American Health Care (arr.)**  
Fieldwork combined with academic study of the health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12 to 20 hours per week) in appropriate health-related activities. Admission by permission of instructor. Undergraduate students only. Staff
- 197 **Current Issues in Bioethics (1)**  
Interdisciplinary approach to problems of bioethics. Presentations by physicians, lawyers, economists, philosophers, and health care administrators. Alexander
- 198 **Psychiatry (4)**  
Four-week rotation in which the student learns to collect and integrate information on psychiatric patients. The student is part of the therapeutic community and assists in identification and treatment of the psychiatric patient. Staff
- 199 **Independent Study (arr.)**  
Required rotation in an area of study chosen by the student and approved by the faculty. Students develop learning objectives in conjunction with their faculty advisors. McConnell
- 201 **Practicum in Geriatric Care (1)**  
Geriatric assessment, including interviewing, physical exam, and functional assessment in outpatient and institutional settings. Participation in home visits and interdisciplinary seminars. Johnson, Stein
- 205 **Diagnosis and Management of Health Deviations (5)**  
Common health deviations of adults, with emphasis on the normal physiological and pathophysiological aspects of systems functioning. The systematic assessment and management of health deviations that forms the foundation of clinical decision making for adult/gerontological nurse practitioners in primary care. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.



- 206 **Clinical Decision Making (2)** Povar  
Methodological approach to clinical problem solving, with emphasis on interpretation of patient histories, physical examinations, laboratory results, and radiographs. Selection of appropriate pharmacological and nonpharmacological therapies. Patient education, counseling, and referral. Students assist in analysis of clinical cases under faculty supervision and learn to evaluate symptoms in relation to pathophysiological changes. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.
- 207 **Practicum in Advanced Health Assessment (arr.)** Staff  
Application of advanced health-assessment and clinical decision-making skills, with emphasis on the collection of data needed to make a comprehensive health assessment. Students work with adult patients in primary care settings under faculty supervision. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.
- 232 **Studying a Study: Methods for Reading the Medical Literature (1)** Riegelman  
Required course for first-year medical students. Principles of analyzing medical journal articles, with emphasis on nonmathematical epidemiology and biostatistical principles and illustrations of errors that can occur in research articles.
- 233 **Epidemiology and Medical Decision Making (1)** Riegelman  
Required course for second-year medical students. Principles of epidemiology and diagnostic testing. Rates of disease, assessment of risk and disease causation, and concepts of reproducibility, range of normal, sensitivity, and specificity. Case studies in epidemiology and introduction to diagnostic decision analysis.
- 301 **Clerkship in Primary Care (8)** Staff  
Required for third-year medical students. Care of patients in ambulatory settings, including the George Washington University Health Plan (HMO), emergency room, and office practices of internists, pediatricians, and family practitioners. Emphasis on specialty areas that contribute to a physician's capacity to care for common minor illnesses: orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Six-week elective periods throughout the academic year.
- 350 **Ambulatory Health Care (arr.)** Pawlson  
Research or clinical experience in primary medical care, including geriatric medicine. Participation in a project relating to health care delivery, including medical audit, study of organization of health services, and problems of underserved (especially elderly) populations. Clinical experience is arranged. Exchanges with similar programs in other institutions are possible, especially for those participating in model family practice units.
- 361 **Family Practice Preceptorship (arr.)** Pawlson  
Family practice preceptorship in rural Maryland, supervised by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program, of which this site is a part.
- 362 **Rural Family Practice Preceptorship (arr.)** Pawlson  
Family health care in a small coal mining town in central West Virginia, supervised by board-certified family practitioners. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Four-week elective periods.
- 363 **Geriatric Medicine (arr.)** Pawlson and Staff  
Clinical experience at a congregate housing facility, outpatient practice, hospital home visits, and a long-term facility. Opportunity to supplement experience with activity at senior centers and day care facilities.
- 369 **Issues in Health Care (2)** Povar  
Required for second-year medical students. Overview of issues such as the organization of health care and the role of different professions, concerns of patients, the patient-practitioner relationship, and legal and ethical problems of medical practice. Individual and group projects, seminar discussions, and panel presentations by patients. (Fall)



- 390-94 **Extramural Health Care Sciences Elective** (arr.)  
Elective periods in community medicine, emergency medicine, or family medicine at other institutions. Blatt
- 399 **Supervised Experience in Ambulatory Health Care** (5)  
For fourth-year medical students by arrangement between the department and the dean's office. Blatt
- 400 **Medical Decision Making** (2)  
Required course for all medical students. Concepts necessary for understanding new diseases, new diagnostic technology, and new therapies, with examples of clinical applications. Principles of decision analysis, cost-benefit analysis, technology assessment, and preventive medicine. Applications of computers to clinical care. Riegelman
- 502 **Organization and Financing of Health Care** (3)  
Structural and financial factors that shape health care delivery in the United States, with emphasis on the organizational provider, although the role of the individual provider is also addressed. Birnbaum
- 504 **Medical Law for the Attending Physician** (3)  
Legal attempts to define professional conduct under varying clinical circumstances. Study of landmark cases and of the process used in the judicial system to analyze the reasonableness of professional conduct. Fiscina and Staff
- 505 **Biomedical Ethics** (5)  
An intensive course in ethics offered cooperatively with the medical schools at Georgetown, Howard, and Uniformed Services Universities. Subjects will be chosen from areas of current tension for the medical professions, including delineation of the physician and patient roles, informed consent, research issues, issues in death and dying, genetic counseling, practitioner's social responsibility, allocation of scarce resources, and federal health policy. Moreno and Associated Faculty

## Interdisciplinary Courses

First-year medical students are required to take Idis 212, administered by the Departments of Anatomy and Physiology. Second-year students are required to take an interdisciplinary program of study that includes Idis 301, Path 201, Phar 201 and 202, HCS 137, and Pchi 201. This program provides basic instruction in various clinical subjects and prepares students for clinical clerkships and electives in the third and fourth years.

- 212 **Neurobiology** (3)  
Same as Anat/Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Staff
- 301 **Introduction to Clinical Medicine** (16)  
One-year course. Integrated, organ-oriented course, with emphasis on physical diagnosis. Basic instruction in child health and development, clinical problem solving, dermatology, gynecology, internal medicine (including subspecialties), neurology, obstetrics, ophthalmology, psychiatry, radiology, and urology. Experience in hospital-based physical diagnosis and history taking. Staff
- 800 **Summer Remedial: Clinical Medicine** (16)
- 801 **Summer Remedial: Neurobiology** (3)

## Medicine

*Chair J. C. Rios*

- 201 **Diagnostic Studies in Clinical Medicine** (1)  
Didactic sessions on physiopathology and its correlation to laboratory studies, practical sessions, and case problems related to the use of laboratory tests and other. Scott



- diagnostic procedures, with emphasis on decision making. Second-year students only.
- 250 **Introduction to Occupational and Environmental Medicine (2)** Chase  
Health effects of various occupational and environmental hazards and pollutants, such as radiation, air and water pollution, toxic substances, and environmental extremes. Perspectives of basic research, federal regulation, labor/management, and the physician.
- 305 **Inpatient Clerkship (10)** Staff  
Required for medical students. Comprehensive study of patients; history and physical examination; ward rounds, consultations, conferences, preceptorial teaching, seminars. V.A. and University Hospitals and Washington Hospital Center. Eight-week periods throughout the academic year.
- 331 **Medical Hematology-Oncology (arr.)** Tziraki and Staff  
Assignment to a ward team dealing exclusively with oncologic problems, including many patients on chemotherapy protocols. Special conferences and regular house staff conferences. Students take night call with the ward team and are expected to function at the level of interns on the team. Four-week periods. University Hospital.
- 332 **Acting Internship in Medicine (5)** Tziraki  
Assignment to a ward team. Responsibility for completing initial patient evaluation and diagnostic and therapeutic plans, writing all medical orders (countersigned by an M.D.), coordinating patient's care, writing progress notes, and dictating discharge summary. Night call with the ward team; supervision by team resident.
- 333 **Acting Internship in Medicine (5)** Curtin  
Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial evaluation, and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultants review patient's problem with student. Four-week elective periods. Washington Hospital Center.
- 334 **Acting Internship in Medicine (5)** O'Connell  
Assignment to a patient-care team under direct supervision of a University resident on general medical wards. Problem-Oriented Medical Record System used. Students complete initial patient evaluation database, are responsible for clinical management during hospitalization, write all orders (reviewed and cosigned by the resident), and present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. Four-week elective periods. V.A. Hospital.
- 335 **Acting Internship in Medicine (arr.)** Wisneski  
Academically oriented acting internship in a community hospital setting. Emphasis on basic clinical medicine. Responsibilities of intern. Holy Cross Hospital.
- 336 **Medical Intensive Care (5)** Schwab and Staff  
Student works on a medical intensive care unit with intern-like duties, including night call. Four-week elective periods. Washington Hospital Center.
- 337 **Senior Clerkship in Medicine (5)** Weiss and Associated Faculty  
Assignment to a ward team that includes a medical resident and attending physician. Students are assigned patients, complete initial medical evaluations and diagnostic and therapeutic plans, and write all orders (countersigned by an M.D.). Night call approximately every third night. Attending rounds conducted by practicing physicians three times per week. Students are expected to attend the daily morning report and noon conference. Providence Hospital.
- 338 **Occupational and Environmental Medicine (arr.)** Chase  
Assignment to Washington Occupational Health Associates, which addresses the effects of occupational and environmental health hazards. Participation in clinical intervention, under physician's supervision. Emphasis on relationship of occupational and environmental medicine to practice of primary care. Opportunity to visit field sites is generally available.
- 339 **Occupational and Environmental Medicine (arr.)** Welch  
A clinical rotation, evaluating patients with a variety of occupational diseases or hazardous exposures. Student assumes primary responsibility for management of cases, including a visit to the workplace when feasible. Each student presents a seminar on a clinical topic.



- 348 **Infectious Disease (5)**  
Patients with a variety of infectious diseases are seen and evaluated in conjunction with an infectious disease Fellow and attending physician. Experience in consulting on ambulatory and hospitalized patients with various documented or potential infectious illnesses. National Naval Medical Center. Wagner
- 349 **Infectious Disease (5)**  
Clinical experience on infectious disease service. Daily work rounds, including lab conferences, journal club. Four-week elective periods. Washington Hospital Center. Levy, Curtin
- 350 **Infectious Disease (arr.)**  
Introduction to the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students assume primary responsibility for infectious disease consultations in conjunction with Fellows, residents, and full-time faculty members. Clinical application of laboratory techniques used in the diagnosis and treatment of patients with infectious disease problems. Emphasis on the usefulness of rapid diagnostic techniques and pharmacology of antimicrobics. Students participate fully in all section activities. Four-week elective periods. V.A. Hospital. Gordin and Staff
- 351 **Infectious Disease (arr.)**  
Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical, and laboratory examination. Experience in consultations on infectious disease and use of antibiotics. Tuazon and Staff
- 352 **Cardiology (5)**  
Experience in ambulatory and hospitalized patient care, ECGs, graphics, CCU, exercise lab. Observation in cardiac catheterization laboratory. Four-week elective periods. Hsu
- 354 **Preceptorship in Cardiology (5)**  
Placement with an affiliated Washington-area practicing cardiologist. Experience in office and hospital cardiology and electrocardiography. Ross
- 356 **Cardiovascular Diseases (arr.)**  
Students participate in two clinical arenas: (1) nonemergent cardiac problems and (2) routine problems and their diagnostic evaluation. Rounds three times weekly. Weekly teaching conferences with members of the cardiology staff. Later assignment to a 12-bed critical-care unit that includes coronary patients and medical-surgical patients with intensive-care problems. Under supervision of a senior resident, student works up patients admitted to these units, attends daily rounds with teaching physicians, and assists in the care of critically ill patients and those with suspected myocardial infarction or cardiac arrhythmias. Includes experience with invasive monitoring and therapeutic techniques. Haider, Meyer
- 358 **Cardiology (5)**  
Participation in the clinical cardiology service of Washington Hospital Center. Bedside evaluation correlated with electrocardiography and other diagnostic studies, including stress testing, phonocardiography, echocardiography, cardiac catheterization, and nuclide angiography. Four-week elective periods. Washington Hospital Center. Lindsay and Staff
- 359 **Coronary Care Unit (5)**  
Participation in the care of patients on the coronary care unit of Washington Hospital Center. Student works closely with house staff and attending staff. Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. Four-week elective periods. Washington Hospital Center. Van Voorhees
- 360 **Cardiology (5)**  
Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization and results in specific cases. Electrocardiography as a tool for evaluating the cardiovascular patient. Patient management. Teaching rounds and conferences. Four-week elective periods. V.A. Hospital. Fletcher\* and Staff

\* Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.



- 361 **Cardiology** (arr.)  
Observation of all aspects of congenital and acquired cardiac disease. Participation in diagnostic and therapeutic work-up of patients and evaluation of acute and long-term effects of medical and surgical interventions. National Institutes of Health. Epstein, Bonow
- 362 **Cardiac Catheterization** (arr.)  
The student interviews and examines two patients before catheterization, analyzes the data available, and presents patients to the catheterization team. Observation of the performance of catheterization, participation in the analysis of hemodynamic and angiographic data, and discussion of the physiologic and pathologic processes involved and the therapy applicable to each case. Pichard, Lindsay
- 363 **Medical Intensive Care and Coronary Care Unit** (5)  
Evaluation and management of acute medical illness, including myocardial infarction; severe heart failure; cardiac dysrhythmia; respiratory, renal, and hepatic failure; GI bleeding; and acid-base and fluid-electrolyte disturbances. Procedures and devices used on the unit, including cardioversion, temporary and permanent cardiac pacemakers, right heart and arterial catheterization, intra-aortic balloon counterpulsation, invasive and noninvasive electrophysiologic study, mechanical ventilators, and oxygen therapy. Students take call every third night with a medical resident and intern. V.A. Hospital. Wish
- 364 **Critical Care Medicine** (arr.)  
Evaluation and treatment of the critically ill, including physical examination, laboratory testing, ECG interpretation, invasive monitoring, ventilator management, dialysis, pharmacotherapy, and nutritional support. Physiology of normal organ system function and the pathophysiology of organ system failure. Combs
- 370 **Endocrinology** (arr.)  
Assignment as an acting intern to work with a second- or third-year resident. Admission and work-up of patients. Consultations of the general medical service on patients with endocrine problems. Daily rounds and weekly teaching conference to discuss endocrine problems. Opportunity for participation at D.C. General Hospital. In-depth evaluation of patients with endocrine problems; emergency care of patients admitted to medical floors and intensive care unit for life-threatening endocrine emergencies. El-Khodary
- 371 **Endocrinology** (5)  
Evaluation of patients referred to the endocrinology service, participation in planning diagnostic work-ups and therapy, and responsibility for case presentations and follow-up of those patients. Daily clinical rounds and weekly endocrine clinic and diabetic clinic. Weekly endocrine conference includes journal club and pediatric endocrinology once a month. Rounds and conferences at the V.A. and University Hospitals when possible. Daily review of assigned reading. Four-week elective periods. Washington Hospital Center. Gaskin and Staff
- 372 **Endocrinology and Diabetes** (arr.)  
Clinical experience in endocrinology and metabolism; emphasis on outpatient care of diabetes mellitus with longitudinal follow-up. Students examine patients and participate in the diagnosis and planning of therapy. Daily rounds, weekly diabetic pregnancy clinic, lectures, and case discussions. University Hospital. Ratner and Staff
- 373 **Endocrinology and Metabolism** (arr.)  
Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Daily clinical rounds; weekly endocrine clinic, diabetic clinic, and journal club; case discussions; lectures. Twice-weekly endocrine reviews based on assigned reading. V.A. Hospital. Becker and Staff
- 375 **Endocrinology Research** (arr.)  
Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic techniques, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor required. Becker



390-95 **Extramural Internal Medicine Elective (arr.)**  
Elective periods at other institutions.

398 **Consultative Medicine (5)**

Medical follow-up of patients on surgical, orthopaedic, psychiatric, and obstetrics and gynecology services. Didactic sessions on preoperative evaluation and perioperative surgical risk.

399 **General Internal Medicine Inpatient Service (5)**

Medical consultative and follow-up services to patients on surgical, orthopaedic, psychiatric, and obstetrics and gynecology services. For students required to undertake remedial work because of unsatisfactory performance in their third-year rotations.

402 **Practicum in Immunologic Techniques (arr.)**

Methodology and/or application of hybridoma monoclonal antibody techniques, both human-human and mouse-mouse. Other monitoring procedures, such as enzyme-linked immunoassays, procedures for extraction of antigenic pieces, and monoclonal antibody-derived epitopes.

403 **Oncology (arr.)**

Participation in clinical management of patients with carcinoma on the oncology ward. Methods of clinical research are stressed. V.A. Hospital.

404 **Oncology (arr.)**

Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, and ovarian, breast, and other malignancies, including an overview of the spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrows, liver biopsies, and other staging techniques. Each student works closely with an oncology Fellow. National Cancer Institute.

405 **Oncology (arr.)**

New patient consultations, ward rounds, and clinic involving patients with both hematologic malignancies and solid tumors. Daily discussions on selected topics in medical oncology. Interdisciplinary conferences with V.A. Hospital staff. Washington Hospital Center.

411 **Gastroenterology/Cardiology (5)**

Observation and assistance in upper endoscopy, colonoscopy, cardiac catheterization, and related procedures, at area hospitals. Work-up of selected cases, reading of relevant literature, and case presentation.

412 **Gastroenterology (arr.)**

Work in a suburban office devoted to private practice of internal medicine, with emphasis on gastroenterology. Office practice, hospital rounds at Holy Cross and Washington Adventist Hospitals, evaluation of problems, discussion with attending physicians and patients in terms of diagnosis and management, observation of and assistance in specialized GI procedures, and practical aspects of office management.

413 **Gastroenterology/Hepatology (5)**

Intensive clinical experience with patients who have diseases of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars, joint conferences with surgery, pathology, and radiology emphasize multidisciplinary approach to digestive diseases.

414 **Gastroenterology/Hepatology Nutrition (arr.)**

Students work closely with Fellows in the gastroenterology/hepatology nutrition section, seeing patients on consultations and being involved in the initial evaluation, patient investigation, and follow-up. Close supervision by both the senior Fellows and senior staff. Direct or indirect participation in all specialized procedures involving various biopsy techniques and endoscopies. Teaching rounds, conferences, and seminars. V.A. Hospital.

415 **Gastroenterology (arr.)**

Course includes direct patient contact on a consultative basis and participation in all section activities, including reviews of gastrointestinal pathology and radiology for individual patients and all procedures, particularly endoscopic. The student is



- expected to develop a basic knowledge of gastroenterology and to participate in a journal activity and may be called on to participate in a case presentation at monthly joint GI grand round sessions. Washington Hospital Center.
- 416 **Gastroenterology** (arr.) Rudzki and Staff  
Participation in ward rounds with Fellows and attending physicians, endoscopic procedures (performed twice a week), journal club, GI medical-surgical conference, teaching conferences, and weekly clinic session. Direct responsibility for a number of consultations under the supervision of the GI Fellows. D.C. General Hospital.
- 417 **Gastroenterology** (arr.) Wong  
Participation in daily inpatient and outpatient activities of the service. Walter Reed Army Medical Center.
- 418 **Gastroenterology** (arr.) Volpe  
Participation in daily inpatient and outpatient activities of the service. National Naval Medical Center.
- 419 **Gastroenterology** (arr.) Gibbons  
Responsibility for the care of patients admitted with GI problems and consultations on patients on other services. Daily rounds and weekly teaching conference. Observation of endoscopic procedures, including esophagogastroduodenoscopy, colonoscopy and polypectomy, laparoscopy, liver biopsies, and esophageal dilatation. Involvement with patients in the intensive care unit with acute gastroenterology problems. Providence Hospital.
- 423 **Gastroenterology** (5) Trujillo, O'Kieffe  
Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. Four-week elective periods. University Hospital.
- 430 **Hematology** (arr.) Schechter\* and Staff  
Experience in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, hematology clinic, and journal club. V.A. Hospital.
- 431 **Hematology/Oncology** (arr.) Lessin and Staff  
Diagnosis and therapy of hematologic and oncologic disorders, including inpatient and outpatient consultations, daily care, and follow-up of clinical hematologic and oncologic problems. Emphasis on blood and marrow morphology, tumor pathology, modern hematologic/oncologic diagnostic procedures, and treatment of blood diseases and cancer.
- 434 **Hematology/Oncology** (arr.) Yoo  
Assignment with senior resident seeing patients with hematologic and tumor problems, interpreting blood smears and blood coagulation studies, and assisting in performance and interpretation of bone marrow examinations. Providence Hospital.
- 436 **Hematology Research** (arr.) Schechter\* and Staff  
Research interests of the staff include lymphocyte tumor biology stem cell culture and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood, bone marrow, and tumors; radioisotopic studies; and electron microscopy. V.A. Hospital.
- 440 **Pulmonary Medicine** (arr.) Spagnolo and Staff  
Experience in the diagnosis and therapy of patients with pulmonary disease. Introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, journal club, and physiology conference. Emphasis on modern pulmonary diagnostic procedures and current literature. V.A. Hospital.

\*Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.



- 441 **Pulmonary Disease** (arr.)  
Responsibility for the care of patients admitted with pulmonary problems and consultations on patients on other services. Daily rounds and weekly teaching conference. Weekly pulmonary physiology conference in which arterial blood gases, pulmonary function testing, and principles of respiratory care are discussed in depth. Consultation services and daily care of a small number of inpatients. Observation of such procedures as pleural biopsy, thoracentesis, lung needle biopsies, and arterial puncture. Involvement on a consulting basis with all patients in the intensive care unit with acute respiratory problems. *Providence Hospital, Levit, Schwab, Friedman*
- 442 **Pulmonary Disease** (5)  
Interpretation of pulmonary function studies. Daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic. Techniques and principles of respiratory therapy. Principles of and experience with respiratory failure and respiratory intensive care. *Washington Hospital Center, Spagnolo and Seif*
- 447 **Pulmonary Medicine** (5)  
Experience in the diagnosis and therapy of patients with pulmonary disorders. Ward rounds, chest roentgenology sessions, and journal club. Emphasis on modern pulmonary diagnostic procedures and current literature. *University Hospital, White*
- 451 **Arthritis and Rheumatic Diseases** (5)  
Experience in the evaluation and treatment of patients with rheumatic diseases including inpatient and outpatient consultations, daily care and follow-up, and clinical conferences. Discussion of selected topics in rheumatology, emphasizing differential diagnosis, pathophysiology, and therapeutic modalities. *Nash*
- 452 **Rheumatology** (5)  
Participation in the work-up and management of inpatients and clinic patients with rheumatic diseases. History, physical examination, differential diagnosis, immunological mechanism, X-ray reading, and use of laboratory tests stressed. *V.A. Hospital, Barth*
- 453 **Introduction to Arthritis** (arr.)  
Work-up, rounds, clinic, and consultations on patients with arthritis and rheumatic diseases. Daily discussions on selected topics in rheumatology, including clinical immunology, major disease categories (SLE, RA, gout, etc.), differential diagnosis, drug therapy, serological reactions, X-ray changes. *Washington Hospital Center, White and Seif*
- 454 **Rheumatology and Orthopaedics (Pediatric)** (arr.)  
Students assist in the evaluation, treatment, and follow-up of children with rheumatic and orthopaedic problems. Responsibilities in outpatient and inpatient services the student may elect to participate in operations. Discussion of selected topics in rheumatology and orthopaedics. Participation in clinical conferences, including physical medicine and radiology. *Children's Hospital, Pierce*
- 455 **Physical Medicine and Rehabilitation** (arr.)  
Management of patients on the inpatient rehabilitation service under supervision. Initial medical and neurological work-up, setting of goals, and participation in rounds and team conferences. Outpatient work includes use of electromyography and the neuromuscular examination as diagnostic tools and management of common musculoskeletal conditions. *Phillips*
- 460 **Renal and Electrolyte Disorders** (arr.)  
Participation in consultations, rounds, and outpatient clinic involving patients with renal and electrolyte abnormalities; follow-up of patients. Examination of the urinary sediment, peritoneum, and hemodialysis. Conferences, reading assignments, journal club. *Washington Hospital Center, Bosch and Seif*
- 461 **Renal Disease** (5)  
Experience in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. *University Hospital, Phillips*
- 463 **Diagnostic Laboratory Immunology** (5)  
Introduction to interpretation of the various laboratory assays used in clinical diagnostic immunology. Review of clinically applied immunology and its relationship to autoimmunity and immunologically mediated pathology. Clinical techniques for altering the course of immunological diseases, such as plasmapheresis. Tissue immunology as related to typing transplant patients. *Phillips*



- 465 **Renal Diseases and Fluid and Electrolyte Problems (5)** Jacobson  
Participation in office and hospital consultations; care of patients with renal diseases and fluid and electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature.
- 469 **Renal Disease (arr.)** Shalhoub\* and Staff  
Participation in all clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and journal club meetings. V.A. Hospital.
- 471 **Allergy Clinic (arr.)** Summers  
Lectures, conferences, and attendance at the allergy clinic, where both adult and child patients are seen. Detailed history taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist to develop a complete management program. Emphasis on clinical aspects of immunology. Walter Reed Army Medical Center.
- 472 **Private Office Practice of Allergy (3)** Barr and Staff  
Combined elective with allergy clinic at University Hospital and Children's Hospital.
- 492 **Emergency Medicine (arr.)** Hannon  
Assignment in the emergency room, providing primary care under the direction of full-time physicians and medical and surgical residents. Emergent and non-emergent ambulatory problems, including medical, surgical, pediatric, psychiatric, trauma, and ob/gyn problems. Emergency therapy instituted prior to admission or discharge. Providence Hospital.
- 494 **Clinical Cancer Epidemiology (arr.)** Levine  
Through the clinical epidemiology branch of NIH, students may participate in research and consultation in the clinical etiology of cancer, seeing patients with peculiarities in the occurrence of cancer that raise the possibility of detecting clues to the etiology of tumors; the application of computer technology to epidemiologic studies; or registry of rare tumors (investigating etiology of rare disorders, e.g., the American Burkitt Lymphoma Registry). Members of this branch participate in the genetics clinic, and students have opportunities for clinical contact while pursuing research and learning basic epidemiologic approaches. Useful for students considering preventive medicine, epidemiology, or public health as a career. National Institutes of Health.
- 495 **Oncology Review (arr.)** Hollinshead  
Fundamentals, basic research, and latest clinical approaches. Student is assigned a reading list on one form of cancer and writes a review of his or her subject.
- 499 **Clinical Electrocardiography (1)** Rios  
EKG interpretation. EKG diagnosis using the spacial vector approach of Dr. R. P. Grant. Diagnosis of arrhythmias, cardiac pacing, holter EKG monitoring, and exercise electrocardiography. All members of the division of cardiology participate in at least one lecture.
- 501 **Immunopathogenesis of Human Disease (3)** Schulof  
Review of recent advances in immunobiology and correlation with clinical manifestations and immunopathogenesis of selected human diseases. Lectures, group discussions, assigned readings, and required seminar presentation based on independent study.
- 502 **Issues in Clinical Nutrition (3)** Tziraki, Fromm, Walker  
Analysis and evaluation of recent scientific data in the area of human nutrition. Topics include megavitamins, trace elements, food additives, fiber content, lipids, proteins, immunological responses, and nutrition as they influence health and disease. Daily didactic sessions; three seminars per week for discussion and analysis of assigned reading. Each student studies a specific area of interest and presents a written analysis of the scientific data.

\*Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.



- 503 **Clinical Physiology of Acid-Base and Electrolyte Disorders** (3) Kimmel  
In-depth review of renal physiology as it relates to clinical medicine, with emphasis on water and electrolyte regulation as well as acid-base and electrolyte disorders. Daily didactic sessions; three seminars with problem-solving cases per week; homework exercises and assigned reading. Each student presents a written report on a clinical entity related to a selected fluid and electrolyte disorder. Welch
- 504 **Topics in Clinical Toxicology and Occupational Medicine** (arr.)  
Clinical toxicology of occupational and environmental medicine. Didactic sessions and student-led seminars. Tuazon, James
- 505 **Geographic Medicine and Tropical Disease** (arr.)  
Lectures, laboratory sessions (examination of various specimens for parasites), patient presentation and demonstration, and group discussion. (Fall)

## Microbiology

*Chair* L. F. Affronti

- 128 **Microbiology for Health Sciences Students** (2) Staff  
Lecture course for students in health sciences programs. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.
- 129 **Immunology: Introduction to Immunologic Fundamentals** (3) Affronti, Silver  
Lecture course for medical technology students; open to others. Fundamental immunologic concepts. Serologic and immunologic procedures as applied to clinical and research situations. Prerequisite: introductory courses in microbiology and chemistry (inorganic and organic), or permission of instructor. (Spring) Staff
- 201 **Medical Microbiology** (8)  
Required for medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts that relate to the health and disease of humans—cultural studies, methods of diagnosis, theories. (Spring) Staff
- 211 **Microbiology** (3)  
For graduate students. Bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221-22, or other biochemistry course, and permission of instructor. (Fall) Staff
- 212 **Pathogenic Bacteriology** (3)  
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: BiSc 111 or equivalent, Bioc 221-22. Laboratory fee, \$20. (Spring) Hugh
- 213 **Bacterial Pathogenesis** (3)  
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall) Hugh
- 214 **Tissue Cell Culture** (3)  
For graduate students. Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Bioc 221-22. (Spring) Albright, Bradlaw
- 215 **Parasitology** (2)  
For graduate students; open to medical students. Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall) Turner
- 219 **Scientific Writing** (1)  
For graduate students. Provides basis for preparing theses, dissertations, and publications. (Fall) Hugh
- 223 **Antimicrobial Chemotherapy** (1)  
For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Prerequisite: Micr 201. (Fall) Reich



- 225 **Microbial Physiology I** (3) Reich, De Giovanni-Donnelly  
For graduate students. Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221-22. (Fall)
- 226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly  
For graduate students. Actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular levels. Prerequisite: Micr 225 or permission of instructor. (Spring)
- 227 **Microbial Physiology Laboratory** (2) Reich  
For graduate students. Application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, \$20. (Fall)
- 229 **Immunology** (3) Kind, Affronti  
For graduate students. Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen and antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Bioc 221-22.
- 230 **Immunology Laboratory** (2) Kind, Affronti  
Methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in the microbiology graduate program. Laboratory fee, \$20. (Fall, odd years)
- 231 **Immunobiology** (1) Affronti, Kind  
For medical students; open to graduate students. Lecture course. Study of immunological functions of reticuloendothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Prerequisite: Micr 201 or 229 and permission of instructor. (Fall)
- 233 **Virology** (3) Stokes  
For graduate students. Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Bioc 221-22 or permission of instructor. (Fall)
- 234 **Virology Laboratory** (2) Stokes  
For graduate students. Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, \$20. (Fall)
- 235 **Systematic Bacteriology** (2) Hugh  
For graduate students. History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years)
- 250 **Pathogenesis of Microbial Infections** (1) Hugh  
For medical students; open to graduate students. Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection. Prerequisite: Micr 201 or 212 and 213.
- 252 **Medical Parasitology** (1) Turner  
For medical students; open to graduate students. Lecture and laboratory course. Life cycles, epidemiology, manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections. Laboratory emphasizes recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens. (Fall)
- 255 **Clinical Virology** (1) Staff  
Elective course for medical students; open to graduate students. General principles of virology, with emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)
- 257 **Experimental Immunochemistry** (3) Affronti  
For graduate students. Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221-22 or equivalent, Micr 229. Laboratory fee for nonmedical students, \$20. Limited enrollment. (Spring, even years)
- 258 **Microbial Genetics** (2) De Giovanni-Donnelly  
For graduate students. Survey of microbial systems that depict basic concepts of genetic principles. (Spring)



- 260 **Cellular Immunology** (1)  
For graduate students. Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit.  
Prerequisite: Micr 229. (Spring) Kind  
Staff
- 277-78 **Seminar: Microbiology** (1-1)  
Required of graduate students. (Academic year) Affronti
- 281 **Biological Basis of Infections** (arr.)  
Selected problems; readings, laboratory studies, term paper. Affronti and Staff
- 282 **Immunology** (5)  
Selected problems in immunology. Library assignments, laboratory research, and term paper. Affronti
- 290-91 **Extramural Microbiology Elective** (arr.)  
Elective periods at other institutions. Staff
- 293 **Special Topics in Microbiology** (arr.)  
May be repeated for credit. (Fall and spring) Staff
- 295 **Research in Microbiology** (arr.)  
Content differs each time course is given. May be repeated for credit. (Fall and spring) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring) Staff
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Affronti
- 800 **Summer Remedial: Microbiology** (8)

## Neurological Surgery

*Chair* E. R. Laws

- 302 **Clinical Clerkship in Neurosurgery** (3)  
Introduction to neurosurgery, emphasizing the neurological examination, diagnosis, and rudiments of treatment. Fulfills the neuroscience course requirement. University Hospital. Laws
- 380 **Neurosurgery** (5)  
Clinical clerkship in neurosurgical service, emphasizing neurologic examination and indications for special neurologic and operative procedures. Medical Faculty Associates and University Hospital. Laws
- 382 **Neurosurgery** (5)  
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, and operating room procedures. National Naval Medical Center. Harris, Pulliam
- 383 **Pediatric Neurosurgery** (arr.)  
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Children's Hospital. McCullough and Staff
- 387 **Neurosurgery** (arr.)  
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Washington Hospital Center. Cooney
- 390-92 **Extramural Neurosurgery Elective** (arr.)  
Elective periods at other institutions.

## Neurology

*Chair* G. F. Molinari

- 380 **Neurology** (arr.)  
Expertise in performing the neurological examination taught through work-up of new hospital and clinical patients, with emphasis on the anatomical localization of Molinari and Staff



neurological symptomatology. Introduction to differential diagnosis. Familiarization with indications for neurological procedures (CT scanning, arteriography, myelography, evoked potentials, and EEG). Lecture series reviews the basic categories of neurological diseases.

### 383 Neurology (5)

Gunderson

Development of proficiency in assessing common neurologic problems through mastery of the routine neurologic history and physical examination, use of laboratory aids, and application of neuroanatomy to clinical problem solving. Treatment of common neurology problems. Walter Reed Army Medical Center.

### 384 Neurology (arr.)

Laureno

Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. Washington Hospital Center.

### 390-94

### Extramural Neurology Elective (arr.)

Elective periods at other institutions.

### 395 Neurology Research (arr.)

Laureno

Participation in ongoing research in nutritional deficiency, toxins, and fluid-electrolyte derangements and their effects on brain and muscle. Washington Hospital Center.

## Obstetrics and Gynecology

Chair A. B. Weingold

### 303 Clinical Obstetrics and Gynecology (10)

Davis

Required for medical students. Participation in all obstetrical and gynecological clinics, daily departmental conferences, and ward rounds. Eight-week periods throughout the academic year. University, Fairfax, and Holy Cross Hospitals.

### 376 Gynecologic Oncology (5)

McGowan

Experience in clinical inpatient and office diagnosis and treatment of women with gynecologic cancer. Medical Faculty Associates.

### 377 Cytogenetics and Prenatal Diagnosis of Birth Defects (arr.)

Larsen

Study of cytogenetics and participation in genetic counseling, amniocentesis, and laboratory evaluation of amniotic fluid. Interpretation and preparation of chromosome karyotype.

### 378 Reproductive Endocrinology and Infertility (arr.)

Stillman

Experience in management of patients with gynecologic endocrine and infertility problems. Infertility work-up and operative diagnostic and therapeutic procedures, including *in vitro* fertilization/embryo transfer.

### 380 Clinical Obstetrics and Gynecology (arr.)

Gahres, Radice

Participation in patient care, clinics, surgery, delivery. Alexandria Hospital.

### 381 Perinatal Medicine (arr.)

Isada

Experience in high-risk obstetrics clinics and antepartum and intrapartum management of high-risk and normal obstetrical patients. Participation with Fellows in maternal-fetal medicine at the University Hospital and outlying hospitals. Required paper.

### 383 Clinical Gynecology (arr.)

Footer

Participation in office practice of gynecology.

### 384 Clinical Obstetrics and Gynecology Surgery (3)

Schneiderman and Staff

Gynecology, obstetrics, and infertility evaluation in office practice. Care of hospitalized patients. Delivery and surgery.

### 390-95 Extramural Obstetrics and Gynecology Elective (arr.)

Elective periods at other institutions.

### 501 Didactic Reproductive Biology (3)

Isada

Intensive interdisciplinary course. Lectures, labs, reading, and seminars reviewing basic anatomy, histology, embryology, and pathology of the female reproductive tract in the context of clinical obstetrics and gynecology. Required paper.



## Ophthalmology

Chair M. F. Armaly

- 381 **Clinical Ophthalmology** (arr.)  
Examination, diagnosis, and management of a wide variety of ocular conditions in ambulatory patients. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Medical Faculty Associates. *Armaly and Staff*
- 382 **Clinical Ophthalmology** (arr.)  
Examination, diagnosis, and management of a wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. National Naval Medical Center. *Sawyer*
- 383 **Clinical Ophthalmology** (3)  
Examination techniques, management decisions, follow-up, and outcome of clinical entities. Observation, demonstration, and discussion with the clinical faculty. Group Health Association. *Ibrahim and Staff*
- 390-92 **Extramural Ophthalmology Elective** (arr.)  
Elective periods at other institutions.

## Orthopaedic Surgery

Chair R. J. Neviasser

- 302 **Clerkship in Orthopaedic Surgery** (3)  
Basic clinical rotation. Didactic sessions on physical diagnosis, X-ray interpretation, arthritis, trauma, and reconstructive surgery. Ward rounds, periods in emergency room or operating room, conferences. Night call is generally required. All affiliated hospitals. *Labropoulos and Staff*
- 380 **Orthopaedic Surgery** (5)  
Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member. Prerequisite: Orth 302. *Wiesel*
- 383 **Sports Medicine** (5)  
Introduction to athletic injuries, including prevention and management. Prerequisite: site: Orth 302. *Haas and Staff*
- 384 **Sports Medicine for Children** (5)  
Diagnostic and treatment methods of outpatient orthopaedic sports medicine for children. Surgical treatment of sports injuries, pediatric orthopaedics, clinical research. Children's Hospital. *Reff*
- 390-93 **Extramural Orthopaedic Surgery** (arr.)  
Elective periods at other institutions. Prerequisite: Orth 302. *Labropoulos*
- 501 **Foundations of Orthopaedic Knowledge** (3)  
Orthopaedic biomechanics, form and function of the musculoskeletal system, concepts and terminology of basic science for clinical research. *Hurwitz*

## Pathology

Chair H. Sidransky

Courses numbered 13 to 20 are open only to military personnel in the medical laboratory technique program.

- 13 **Hematology** (6)  
Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology. *Staff*



- 14 **Blood Banking (6)** Staff  
Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.
- 15 **Clinical Laboratory Rotation (14)** Staff  
Instruction in laboratory technique, stressing the application of theories and principles of clinical chemistry, microbiology, hematology, and blood banking in the clinical laboratory.
- 16 **Clinical Chemistry (5)** Staff  
Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.
- 17 **Urinalysis (2)** Staff  
Principles and techniques of urine chemistry and microscopic analysis.
- 18 **Bacteriology (6)** Staff  
Identification of pathogenic microorganisms by morphologic and cultural techniques.
- 19 **Parasitology (4)** Staff  
Identification of human parasites and their life cycles. Concentration methods, staining techniques, and media for culture.
- 20 **Serology (2)** Staff  
Principles and techniques of antigen-antibody reaction and immunological responses.
- Courses numbered 121 to 126, 130 to 133, and 140 are open only to students in the clinical year of the medical technology program.
- 121 **Introduction to Medical Technology (4)** Silver, Smith  
Orientation to laboratory medicine. Clinical chemistry, hematology, microbiology, and immunohematology. Lecture and laboratory. Path 121 is prerequisite to all other courses in the clinical year of the medical technology program.
- 122 **Clinical Chemistry (3)** Staff  
Lecture course in the principles and procedures involved in chemistry analysis of human blood and body fluids. Clinical correlations and pathological aspects of human disease. Prerequisite: Path 121.
- 123 **Clinical Microbiology (2)** Silver  
Lecture course in clinical microbiology, with emphasis on pathogenic characteristics, isolation, and identification of organisms related to human disease. Prerequisite: Path 121.
- 124 **Immunohematology (1)** Staff  
Lecture course in immunological aspects of transfusion of human blood. Emphasis on preparation and administration of blood components. Prerequisite: Path 121.
- 125 **Clinical Hematology and Coagulation (2)** Smith  
Lecture course in the laboratory detection, clinical correlation, and pathophysiology of human blood cell diseases and coagulation disorders. Prerequisite: Path 121.
- 126 **Special Topics in Laboratory Medicine (2)** Smith and Staff  
Principles of clinical parasitology, mycology, serology, laboratory management, and education techniques. Prerequisite: Path 121.
- 127-28 **Pathology for Health Sciences Students (2-2)** Kent  
For part-time students in the physician assistant program only. Same as Path 129.
- 129 **Pathology for Health Sciences Students (4)** Kent  
Lecture course. Basic concepts and language of pathology; infectious diseases and fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathological changes in the principal diseases of each organ system, presented in coordination with clinical lectures in Idis 301.
- 130 **Clinical Chemistry Practicum (4)** Silver  
Rotation through the University Hospital clinical chemistry laboratory. Prerequisite: Path 121.
- 131 **Clinical Microbiology Practicum (4)** Silver  
Rotation through the University Hospital clinical microbiology, mycology, virology, and parasitology laboratories. Prerequisite: Path 121.



- 132 **Hematology, Coagulation, and Urinalysis Practicum (4)**  
Rotation through the University Hospital clinical hematology, coagulation, and urinalysis laboratories. Prerequisite: Path 121. Silver
- 133 **Blood Bank and Serology Practicum (4)**  
Rotation through the University Hospital blood bank and serology laboratory. Prerequisite: Path 121. Silver
- 140 **Independent Study in Medical Technology (arr.)**  
Intensive review of medical technology, with assigned readings and participation in selected courses in the medical technology program. Registration by petition. Staff
- 152 **Introduction to Basic Laboratory Medicine (2)**  
Theory, performance, and interpretation of routine clinical laboratory tests done in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals, and laboratory. Prerequisite: Path 127-28. Smith
- 201 **Pathology (8)**  
A year-long course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Kent and Staff
- 203-4 **Pathology (4-4)**  
For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year) Kent and Staff
- 217 **Gross Autopsy Pathology (1)**  
Review of current necropsy cases, with emphasis on the correlation of gross changes in the organs and the clinical history. Limited to second-year medical students. University Hospital. (Spring) Orenstein and Staff
- 220 **Medical Mycology (2-4)**  
Lecture and laboratory course covering pathogenic fungi, mycotic diseases, and their clinical aspects. (Fall) Al-Doory
- 222 **Opportunistic Mycoses (2)**  
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring) Al-Doory
- 256 **Pathology of Infectious Diseases (3)**  
For graduate students. Correlation of clinical, physiological, immunologic, and pathological mechanisms determining the course and morphological changes that occur in infections. Analysis of cases and review of assigned readings. Prerequisite: Micr 211, Path 203. Abraham
- 257 **Transmission Electron Microscopy in Pathologic Diagnosis (3)**  
For graduate students. Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261. Bloom
- 258 **Organ System Pathology (5)**  
For graduate students. Gross and microscopic study of human pathological material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring) Sidransky
- 261 **Seminar in Experimental Pathology (1)**  
Current topics in research in experimental pathology. Limited to second-year medical students. (Spring) Zook
- 266 **Comparative Pathology I (1)**  
Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to second-year medical students. Pathology Laboratory, National Zoological Park. (Spring)



- 270 **Medical Mycology** (1) Al-Doory  
Review of major mycotic diseases, with emphasis on opportunistic mycoses. Limited to second-year medical students.
- 284 **Ophthalmic Pathology** (arr.) McLean and Staff  
Participation in an active service limited to pathology of the eye and its adnexa, particularly inflammatory, degenerative, and neoplastic diseases. Armed Forces Institute of Pathology.
- 286 **Perinatal Pathology** (arr.) Kent  
Focuses on important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203, 204, and permission of instructor. (Spring)
- 289 **Clinical and Anatomical Pathology** (arr.) Cook and Staff  
Designed to familiarize the student with the operation of the pathology department in a community hospital. Student may elect to concentrate in a specialized area or to study only anatomic pathology. A nuclear medicine elective is also available. Fairfax Hospital.
- 290-92 **Extramural Pathology Elective** (arr.)  
Elective periods at other institutions.
- 296 **Surgical Pathology** (arr.) Silverberg and Staff  
Evaluation of surgical specimens and correlation with clinical status of patient. Description of gross and microscopic findings on assigned cases. University Hospital.
- 298 **Autopsy Pathology** (arr.) Orenstein, Kent  
Organ changes in disease, gross and microscopic correlation, preparation of protocols. Participation in autopsy pathology service. University Hospital.
- 299-300 **Thesis Research** (3-3) Staff  
(Fall and spring)
- 301 **Clinical and Anatomical Pathology** (arr.) B. Smith and Staff  
Opportunity to explore in depth a topic selected from the field of pathology. Assigned readings. V.A. Hospital.
- 302 **Forensic Pathology** (arr.) Kim  
Experience in the Office of the Chief Medical Examiner of the District of Columbia. Observation of death scene investigation techniques, medical-legal autopsies, and related toxicological laboratory analyses; attendance at court trials; and participation in the various conference activities of the agency.
- 398 **Advanced Reading and Research** (arr.) Staff  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)
- 399 **Dissertation Research** (arr.) Staff  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)
- 501 **Selected Topics in Pathology** (3) Kent and Staff  
Guided readings, study, and/or laboratory experience in an aspect of pathology of particular interest to students. Students present a report on the specific topic.
- 800 **Summer Remedial: Pathology** (8) Kent

## Pediatrics

Chair J. L. Sever

- 303 **Pediatric Clerkship** (10) Greenberg  
Required for medical students. Full-time experience as part of resident team. Ward rounds, work in outpatient department and specialty clinics under staff supervision, lectures, clinical conferences, grand rounds. Includes child psychiatry and child guidance. Eight-week periods throughout the academic year. Children's Hospital.
- 360 **Clinical Pediatrics Acting Internship: Adolescent Unit** (5) Einhorn  
Four-week elective periods. Children's Hospital.



- 361 **Clinical Pediatrics Acting Internship: Infectious Diseases (5)**  
Four-week elective periods. Children's Hospital. Einhorn
- 362 **Clinical Pediatrics Acting Internship: General Medicine (5)**  
Children aged 2 months to 3 years. Four-week elective periods. Children's Hospital. Einhorn
- 363 **Clinical Pediatrics Acting Internship: General Pediatrics (5)**  
Children aged 3 to 12 years. Four-week elective periods. Children's Hospital. Einhorn
- 365 **Clinical Pediatrics Acting Internship: General Pediatrics (5)**  
Ward and ambulatory services. Lectures, conferences, rounds. Four-week elective periods. Holy Cross Hospital. Van Brakle
- 366 **Mental Retardation (arr.)**  
Review of etiologic factors, clinical manifestations, seizures, disorders, therapeutic and preventive aspects, sociological problems, and restorative and rehabilitative approaches to chronic disease/disorder. Experience in a medical care delivery program and three educational programs for the retarded. Hospital for Sick Children. Bartle
- 373 **Pediatric Urology (arr.)**  
Experience in treatment of inpatients and outpatients, including assessment, diagnostic evaluation, and surgery. Four-week elective periods. Children's Hospital. Belman
- 374 **Pediatric Orthopaedic Surgery (5)**  
Four-week elective periods. Children's Hospital. Nason
- 375 **Pediatric Surgery (arr.)**  
Supervised participation in surgical service for infants and children, including newborn surgery and surgery for trauma and neoplasms. Children's Hospital. Randolph and Staff
- 376 **Pediatric Neurology (5)**  
Inpatient and outpatient management of children with a variety of neurologic disorders. Experience in the gamut of diagnostic procedures. Participation in regularly scheduled clinical rounds, conferences, and seminars is encouraged. Children's Hospital. Gale
- 378 **Genetics (5)**  
Principles of basic human genetics, with emphasis on the dysmorphic child, chromosomal aberrations, and genetic counseling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. Four-week elective periods. Children's Hospital. Rosenbaum
- 379 **Pediatric Intensive Care (arr.)**  
Pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Supervised patient responsibility. Children's Hospital. Holbrook, Fields, Pollack
- 380 **Development Disabilities (arr.)**  
Theoretical issues of development, clinical appraisal, and intervention strategies for disability in vision, audition, motor functions, cognition, language, feeling, and affective development. Includes review of normal development in all areas. Weekly reading assignments, written projects, and discussion sessions. Hospital for Sick Children. Bartle
- 381 **Pediatric Allergy and Immunology (5)**  
Introduction to pediatric allergy and clinical immunology; clinics and wards. Some experience in experimental techniques, pulmonary function testing, and objective methods of clinical evaluation. Children's Hospital. Sly, Josephs, Slater
- 382 **Pediatric Radiology (arr.)**  
Participation in conferences and observation in the department. Conventional and newer nonconventional body-imaging techniques are stressed. Children's Hospital. McSweeney and Staff
- 383 **Pulmonary Medicine (arr.)**  
Introduction to SIDS and sleep apnea program, pulmonary function testing, and fiber-optic bronchoscopy. Diagnostic and therapeutic procedures. Pulmonary and nutritional manifestations and complications in cystic fibrosis patients, from newborns to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. Children's Hospital. Fink
- 386 **Pediatric Hematology/Oncology (5)**  
Clinical course on the diagnosis and management of children with hematologic and oncologic diseases. Laboratory experience, including examination of peripheral blood smears. Children's Hospital. Leiken and Staff



- eral blood smears and bone marrow aspirates and interpretation of laboratory tests. Four-week elective periods. Children's Hospital.
- 387 **The Chronically Ill Child and Family in the Community** (arr.) Battle  
Emphasis on care provided children with chronic illnesses in the hospital and in the community. Introduction to the health team concept and preparation to serve as part of an interdisciplinary health care team. Contact with nurses, allied health professionals, and other team members. Focus on the biosocial aspects of care and on improving the functioning of children with chronic illness, rather than on specific diseases. Hospital for Sick Children.
- 388 **Newborn Medicine** (arr.) Avery and Staff  
Observation and experience in the intensive care of infants. Four-week elective periods. Children's Hospital.
- 389 **Pediatric Cardiology** (5) Perry and Staff  
Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catheterizations. Four-week elective periods. Children's Hospital.
- 390-95 **Extramural Pediatric Elective** (arr.)  
Elective periods at other institutions.
- 396 **Approach to Care of Child with Handicapping Conditions** (arr.) Battle  
Multidisciplinary approach to care of children with multiple handicaps, developmental delay, and/or chronic illness, in clinical assessments, therapy sessions, and interdisciplinary conferences. Reaction and behavior of the child, family, and staff are explored. Weekly reading assignment, written projects, and discussion sessions. Hospital for Sick Children.
- 397 **Pediatric Nephrology** (arr.) Bock and Staff  
Emphasis on clinical pediatric nephrology of inpatients and outpatients. Opportunities for evaluation of new referrals for renal problems and the management of known renal disease in children. Research opportunities are available in immunologic causes of renal disease, complement abnormalities, vitamin D metabolism, acid-base physiology, and renal physiology, but clinical aspects of the program are stressed. Children's Hospital.
- 399 **Ambulatory Adolescent Medicine** (5) Silber and Staff  
Outpatient clinic experience in diagnosis and management of adolescent problems, under supervision of senior staff and fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, adolescent grand rounds, and twice-weekly conferences with director of outpatient management and department chair. Children's Hospital.
- 400 **Pediatric Laboratory Medicine** (arr.) Campos and Staff  
Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. Four-week elective periods. Children's Hospital.
- 401 **Pediatric Otolaryngology** (5) Milmoie and Staff  
Otoscopy examination of infants and children. Management of common middle-ear disorders. Evaluation of stridor and airway compromise. Children's Hospital.
- 403 **Pediatric Rehabilitation** (arr.) Koch and Staff  
Acute and chronic disabling disorders in infants and children. Normal neuromuscular development and physical examination, with emphasis on posture and movement. Electrodiagnostic techniques and the use of non-M.D. therapists in rehabilitation. Observation of pathologic states referred for treatment, including the prescription of braces and adaptive equipment. Children's Hospital.
- 404 **Being an Effective Teacher** (3) Greenberg  
Theory of problem solving, learning of preference styles, and interpersonal skills that affect teaching. Assigned readings and assessment of teaching and learning styles and teaching effectiveness. Children's Hospital.
- 501 **Embryologic Basis of Pediatric Surgical Disease** (3) Newman  
The embryogenesis of congenital defects and the principles underlying their diagnosis and surgical correction. Lectures, seminars, and readings. Children's Hospital.



## Pharmacology

Chair H. G. Mandel

- 110-11 **Pharmacological Basis of Anesthesia (4-4)**  
 For students in nursing anesthesia. Principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system, and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics. (Academic year) Mazel and Staff
- 114 **Drugs and the Consumer (3)**  
 General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hay fever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. Limited enrollment. (Fall) Cohn and Staff
- 115 **Nonmedical Use of Licit and Illicit Drugs (3)**  
 Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, and prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, and hallucinogenic and psychedelic drugs. (Spring) Cohn and Staff
- 120 **Readings in Pharmacology for Anesthesia (arr.)**  
 For students in nursing anesthesia. Assigned readings in anesthesia and related areas; preparation of reports. Mazel and Staff
- 124-25 **Chemistry and Physics of Anesthesia (3-3)**  
 For students in nursing anesthesia. Basic concepts of physics, general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid-base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, and physiochemical properties of anesthetic agents. (Academic year) Mazel and Staff
- 130 **Seminar: Accessory Drugs in Anesthesia (2)**  
 For students in nursing anesthesia. Pharmacology and pharmacodynamics of accessory anesthetic drugs, with emphasis on those areas not covered in Phar 110-11. Mazel and Staff
- 158 **Pharmacology for Health Sciences Students (4)**  
 Drug disposition. Autonomic nervous system, cardiovascular, and gastrointestinal drugs. Psychopharmacology. Analgesics, sedatives, anticonvulsants. Chemotherapy, toxicology, endocrinology. Prerequisite: Anat 115, Phyl 111; or equivalent. Straw and Staff
- 159 **Introduction to Pharmacology I (3)**  
 For part-time students in health sciences programs. Includes all topics covered in Phar 158 except gastrointestinal drugs, anticonvulsants, and endocrinology. Students who receive credit for Phar 158 may not receive credit for Phar 159 or 160. Prerequisite: Anat 115, Phyl 111, and permission of instructor. (Spring) Straw
- 160 **Introduction to Pharmacology II (1)**  
 Continuation of Phar 159 for part-time students in health sciences programs. Gastrointestinal drugs, anticonvulsants, and endocrinology. Students who receive credit for Phar 158 may not receive credit for Phar 159 or 160. Prerequisite: Phar 159 and permission of instructor. (Spring) Straw
- 191 **Respiratory Care (3)**  
 For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support. Same as Anes 191. Mandel and Staff
- 201-2 **Pharmacology (6-2)**  
 Required for second-year medical students. Lectures, laboratory, and conferences on interaction of drugs and biological systems as a basis for rational disease therapy. Prerequisite: Bioc 201; Phyl 201, 212. Mandel and Staff



- 203 **Fundamental Principles of Pharmacology and Toxicology (3)** Cohn and Staff  
For graduate students. Basic principles of pharmacology, including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of instructor. (Fall)
- 205 **Pharmacology (8)** Cohn and Staff  
For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)
- 207 **Pharmacology for Health Sciences Students (4)** Straw and Staff  
Same as Phar 158, but with additional course requirements. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.
- 220 **Molecular Events in Toxic Actions (2)** Staff  
For graduate students. Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)
- 222 **Genetic Toxicology (2)** Staff  
For graduate students. Action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221-22. (Spring)
- 230 **Special Topics in Toxicology (arr.)** Staff  
For graduate students. Selected aspects of toxicology. Content differs each time course is offered. May be repeated for credit. (Fall and spring)
- 254 **Frontiers in Pharmacology (1)** Klubes  
For medical and graduate students. Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)
- 258 **Cancer Chemotherapy (1)** Mandel and Staff  
For medical and graduate students. Seminars and lectures by scientists involved in current research on cancer and cancer chemotherapy. (Spring, even years)
- 259 **Readings: Cancer and Cancer Chemotherapy (2)** Staff  
For medical and graduate students. Selected readings and discussion of recent advances in cancer and cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years)
- 260 **Endocrine Pharmacology (1)** Staff  
For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)
- 269 **Pharmacology Seminar (1)** Mandel and Staff  
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered. May be repeated once for credit. (Fall)
- 272 **Physiological Disposition of Drugs (3)** Cohn  
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current literature. Prerequisite: Bioc 221-22, Phar 203, or permission of instructor. (Spring)
- 273 **Pharmacokinetics: Principles and Applications (2)** Abramson and Staff  
For graduate students. Description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)
- 275-76 **Advanced Topics in Pharmacology and Toxicology I-II (1-1)** Cohn and Staff  
For graduate students. Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)
- 277-78 **Advanced Topics in Pharmacology and Toxicology III-IV (1-1)** Cohn and Staff  
For graduate students. Continuation of Phar 275-76. (Alternate academic years)



- 279 **Special Topics in Pharmacology** (arr.)  
For graduate students. Selected aspects of drug action. Content differs each time the course is offered. May be repeated once for credit. (Fall and spring) Staff
- 280 **Neuropharmacology** (2)  
For graduate students. Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring) Valentino, Perry
- 285 **Readings in Pharmacology** (arr.)  
Assigned reading and preparation of reports. Mandel
- 286 **Research in Pharmacology** (arr.)  
For medical students. Participation in experimental studies in pharmacology, particularly neuropharmacology, cancer chemotherapy, or drug metabolism. (Fall) Mandel
- 287 **Readings in Drug Abuse Literature** (arr.)  
Professional and nonprofessional literature on drug dependence. Informal luncheon discussions or assigned reading and preparation of a report. (Spring) Cohn
- 290-91 **Extramural Pharmacology Elective** (arr.)  
Elective periods at other institutions. Staff
- 295 **Reading and Research** (arr.)  
May be repeated for credit. (Fall and spring) Staff
- 299-300 **Thesis Research** (3-3)  
(Fall and spring) Staff
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Staff
- 501 **Readings in Pharmacology** (arr.)  
Readings, discussions, and/or preparation of report. Student can choose to work with one or more faculty members in the department on a topic of mutual interest. (Fall and spring) Mandel and Staff
- 502 **Clinical Use of Drugs** (3)  
Discussion of the rational use of drugs in the treatment of disease. Independent reading and study. (Spring) Cohn and Staff
- 503 **Drug Dependence: Basic and Clinical Aspects** (3)  
Seminars and discussion on various aspects of drug and chemical dependencies, such as recognition and diagnosis of dependence; the role of drugs in treating dependence; fetal alcohol syndrome and the addicted neonate; recent research on marijuana, cocaine, PCP, and other drugs; and treatment of the drug overdose emergency. Independent reading and study. Mandel
- 800 **Summer Remedial: Pharmacology I** (6)  
801 **Summer Remedial: Pharmacology II** (2)

## Physiology

Chair R. A. Kenney

**Departmental prerequisite:** Phyl 201 or equivalent is prerequisite to all courses numbered above 201, except Phyl 205, 212, and 221.

- 111 **Physiology for Health Sciences Students** (4)  
For students in the physician assistant and nursing anesthesia programs. Function and process of the human body, covering the major organ systems. Staff
- 191 **Selected Topics in Human Structure and Function** (3)  
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on Kenney



completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11-12 or equivalent and consent of instructor. Open to Columbian College students with approval of advisor. (Fall)

201 **Physiology** (8) Staff

Required for medical students, open to graduate students. Cellular, organ system, and applied human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of department chair. Concurrent registration: Phyl 212. Open to consortium students only with permission of department chair. (Spring)

205 **Cell Biophysics** (2) Cassidy, Kuranstin-Mills

For graduate students. Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Prerequisite: BiSc 11-12 or equivalent and consent of instructor. (Fall)

212 **Neurobiology** (3) Staff

For graduate students. Same as Anat/Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, \$25. (Spring)

221 **Seminar** (1) Cassidy

For graduate students. Staff and student presentations from literature. Present work discussed; experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion of principles of fluid and acid-base balance and their applications. (Fall)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Admission by permission of instructor. (Fall)

282 **Experimental Physiology** (arr.) Staff

Participation in an ongoing research program in the department. Programs currently available in membrane physiology, intestinal transport, neurophysiology, and cardiovascular physiology.

290-91 **Extramural Physiology Elective** (arr.)

Elective periods at other institutions.

295 **Research** (arr.) Staff

By special arrangement with individual staff members. Approximately four hours per week in the laboratory for each semester hour of credit. May be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff

Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299-300 **Thesis Research** (3-3) Staff

(Fall and spring)

396 **Advanced Reading and Research** (2) Staff

Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff

Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring)



- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Philosophy candidates. May be repeated for credit.  
(Fall and spring) Staff
- 501 **Physiology of Aging** (3)  
Guided reading and discussion on the normal process of aging. Kenney
- 502 **Structural-Functional Correlations in GI Disease** (arr.)  
Morphological methodology, technique in the diagnosis and prognostic evaluation of gastrointestinal disease states such as ulceration, colitis, Hirschsprungs disease, colorectal carcinoma, and pancreatic malfunction. Techniques considered include traditional light microscopy, scanning and transmission electron microscopy, and immunocytochemistry. Selected readings and discussion. Cassidy
- 503 **Advanced Physiology** (arr.)  
Guided readings, study, and/or laboratory experience at an advanced level in a subfield of physiology. Kenney
- 800 **Summer Remedial: Physiology** (8) Staff

## Psychiatry and Behavioral Sciences

Chair J. M. Wiener

All clinical courses carry 5 semester hours of credit per four-week period.

- 210 **Death and Dying** (1)  
Consideration of issues related to death and dying, including care and assessment of the terminally ill, hospice care, rights of the dying patient, suicide, and survivorship and bereavement. Special section on AIDS. Perlin, Akman
- 211 **Introduction to Clinical Psychiatry** (2)  
In-depth study of topics in psychiatry of interest to students. Students meet with faculty to discuss readings and research and, on occasion, interview patients in the hospital. Topics regularly include psychoanalysis, eating disorders, consultation liaison, death and dying, and child psychiatry. Sanders and Staff
- 212 **Application of Psychoanalytic Principles to the Practice of Medicine** (1)  
Special course designed for medical students by the extension division of the Washington Psychoanalytic Institute, taught by a practicing psychoanalyst. Staff
- 213 **Identity and Role of the Physician** (1)  
Didactic material combined with experimental models, including group dynamics. Emphasis on issues of concern to women. Robinowitz
- 215 **Individual Student Preceptorship** (1)  
First- and second-year medical students may arrange individual preceptorships other than those listed, with permission of department chair. Wiener and Staff
- 252 **Biopsychosocial Model in Medical Practice** (3)  
Required for medical students. Basic principles of the doctor-patient relationship. Analysis of psychological growth and development, family process, and the personality of the physician as they influence everyday medical practice. Walsh and Staff
- 301 **Psychopathology and Conceptual Models** (2)  
Required for second-year medical students. Mental mechanisms, psychopathology, introduction to psychiatric syndromes, clinical interviewing, and behavioral sciences in clinical medicine. (Fall) Sanders and Staff
- 302 **Clinical Clerkship** (10)  
Required for medical students. Supervised examination, diagnosis, and outpatient and inpatient treatment at University, St. Elizabeths, Children's, and V.A. Hospitals. Northern Virginia Mental Health Institute, and Psychiatric Institute of Washington. Case conferences, seminars on psychiatric referral, "psychiatric" drugs, and community resources, with emphasis on psychiatry in general practice. (Fall and spring) Akman and Staff
- 381 **Clinical Psychiatry** (arr.)  
Participation as acting intern in one or more of the psychiatry services of GWU Medical Center: inpatient and emergency, outpatient, consultation liaison, and Staff



oncology liaison. Assignments are based on student preference if possible. A rotation of at least eight weeks is preferable for supervised psychotherapy experience; four-week elective emphasizes diagnostic assessment and briefer treatment modalities.

383 **Consultation Liaison** (arr.)

Frankel, Perlin

An individualized program on the consultation liaison service, with emphasis on psychosocial factors affecting the onset, manifestations, and treatment of medical illness. Issues of death and dying. Involvement in the consultation process, conferences, liaison meetings, individual supervision of clinical work, and directed readings.

385 **Psychiatric Research Elective** (arr.)

Kirch

Participation in ongoing laboratory and clinical research in the neurosciences. Publication expected. National Institute of Mental Health.

386 **Research and Clinical Approaches to Families of Medical Patients** (arr.)

Steinglass and Staff

Introduction to theory, method, and techniques of clinical and research evaluation of families of medical patients, with emphasis on family factors that favor or retard the patient's recovery from serious illness. Completion, under supervision, of a small independent project on a topic of student's choice.

388 **Child and Adolescent Psychiatry** (arr.)

Egan and Staff

Experience as an acting intern in child psychiatry. Consultation to pediatric wards, outpatient evaluation and treatment of selected patients and their families, and/or inpatient child and adolescent services; eight weeks required for specialized experience in all three areas. Individualized program by arrangement. When possible, assignments are based on student's preference and prior experience. Children's Hospital.

390-93 **Extramural Psychiatry Elective** (arr.)

Elective periods at other institutions.

397 **Schizophrenic and Borderline Conditions** (5)

Fenton, Williams

Participation in and study of treatment and administrative management of patients. Participation in staff meetings. Individual supervision and selected readings. Chestnut Lodge, Rockville, Maryland.

406 **Psychiatric Education, Research, and Administration** (arr.)

Robinowitz and Staff

Student preceptorship: practicum experience, instruction in theory, participation in research, and individual project. Direct supervision by and close working contact with director and staff of office of education of national specialty society. Individualized program in areas such as women in medicine, psychiatric education, manpower development relevant to health care delivery, continuing education, federal and legislative affairs, health planning, and relation of medical education to practice.

409 **Independent Study** (arr.)

Wiener

Individualized study, clinical training, or research experience selected on the basis of the student's interests and available resources. Topics may include death and dying, suicide, medical ethics, depression, or other issues in psychiatry and behavioral science. Must be arranged prior to registration.

800 **Summer Remedial: Medical Practice** (3)

Wiener

801 **Summer Remedial: Conceptual Models** (2)

Wiener

## Public Health

Public health courses are open only to students in the M.P.H. program or with permission of the M.P.H. program director.

201 **Epidemiology and Preventive Medicine** (3)

Cawley, D'Angelo

Principles of epidemiology and preventive medicine, including rates of disease, principles of screening, and descriptive epidemiology. Population dynamics and special populations, including consideration of maternal and child health and geriatrics. Applications to infectious and chronic diseases and to environmental and occupational health. (Fall)



- 202 **Biostatistical Applications for Public Health (3)** Hirsch, Riegelman  
Application of biostatistical principles to critical analysis of retrospective and prospective studies, controlled clinical trials, and reports in the health services literature. Selection, basic calculations, and interpretation of statistical methods. (Fall) Potar
- 204 **Health Policy and Ethics (1)**  
For students in the joint M.D.-M.P.H. program. Current issues in health policy and bioethics. Prerequisite: HCS 369. (Fall) Glover, Kanwal
- 205 **Health and Society (2)**  
Issues related to the health of the public considered from the viewpoints of economics, law, political science, sociology, history, and biomedical ethics. (Summer) Staff
- 206 **Colloquium in Health Policy (1)**  
Seminars and lectures by experts in health policy. Content changes each year. (Spring) Greenberg and Staff
- 211 **Economics of Health Care (3)**  
Principles of microeconomics applied to health care delivery and health policy, including discussion of incentive systems, markets and competition, regulation, and the economics of health care technology. Same as HSA 262. (Fall and summer) Crum and Staff
- 213 **Administration of Health Systems (3)**  
Application of management and organization theory to issues of health services delivery, institutional leadership and governance, and management of conflict and change. Same as HSA 260. (Fall and summer) Reeves and Staff
- 214 **Health Planning and Marketing (3)**  
Strategic planning, marketing, policy analysis, and evaluation techniques for health care delivery services. Prerequisite: PubH 213. Same as HSA 264. (Spring) Staff
- 220 **Decision Making in Clinical Epidemiology and Public Health (2)**  
Quantitative and qualitative approaches to decision making. Decision analysis and cost-effectiveness analysis. Survey design methods. Applications to technology assessment. Prerequisite: PubH 201. (Spring) Welch and Staff
- 221 **Occupational and Environmental Health (2)**  
Principles of occupational and environmental medicine, building on the concepts introduced in PubH 201. Exposure assessment. Diagnosis of clinical disease that is secondary to work or environment. Principles of occupational and environmental epidemiology. Legal, social, and ethical issues in occupational and environmental health. Prerequisite: PubH 201. (Spring) Riegelman and Staff
- 222 **Case Studies in Preventive Medicine (2)**  
Consideration of selected issues in primary and secondary prevention, with emphasis on the application of skills acquired in previous courses. Prerequisite: PubH 201, 202. (Summer) Davis and Staff
- 223 **Implementing Preventive Medicine (1)**  
Practical application of principles of preventive medicine to programs in clinical, occupational, and public health settings. Prerequisite: PubH 201, 202. (Summer) Kallenberg, Orthner, and Staff
- 230 **Computer Applications for Public Health (3)**  
Use of computers in management of health data. Laboratory instruction in use and application of software packages. Prerequisite: PubH 202. (Spring) Staff
- 231 **Methodology of Occupational and Environmental Health (3)**  
Epidemiologic methods used in studies of occupational and environmental health. Topics include more detailed elements of toxicology and technical aspects of environmental assessment. Prerequisite: PubH 201, 202. (Spring) Hirsch
- 233 **Biostatistics for M.D.-M.P.H. Students (2)**  
Selection, basic calculations, and interpretation of statistical methods applicable to public health, including an introduction to epidemiological analysis, analysis of variance, correlation, and regression. (Spring) Hirsch
- 240 **Design and Analysis of Health Studies (3)**  
Skills-oriented course, stressing study design and biostatistical techniques for study analysis. Prerequisite: PubH 202. (Spring)



- 241 **Occupational and Environmental Health Policy (3)** Staff  
Development and implementation of policies and regulations. Principles of risk assessment and risk communication. Case studies of recent policy decisions in occupational and environmental health. Prerequisite: PubH 201, 202, 221, 231. (Summer)
- 263 **Health Services Financial Management (3)** Staff  
Introduction to the management of resources and administration of funds for health services institutions and agencies. Financial analysis, management of plant and equipment, containment of costs, and safeguarding of assets. Preparation of budgets, financial statements, and reports. Prerequisite: PubH 211. Same as HSA 263. (Spring)
- 265 **Health Law (3)** Staff  
Aspects of the legal system that affect public health and health services delivery. Study of the administrative process in regulatory agencies. Torts, contracts, insurance, labor relations, legal problems involved in the control of contagious diseases. Litigation procedures that relate to the public health specialist. Same as HSA 265. (Spring)
- 293 **Topics in Epidemiology and Preventive Medicine (1)** Staff  
In-depth examination of a particular facet of epidemiology or preventive medicine. Topics vary. Prerequisite: PubH 201, 202. (Summer)
- 294 **Topics in Occupational and Environmental Health (1)** Staff  
In-depth examination of a particular facet of occupational and environmental health. Topics vary. Prerequisite: PubH 201, 202. (Summer)
- 295 **Special Projects (4)** Staff  
With faculty supervision, the student undertakes an original project that applies the skills and knowledge gained in the M.P.H. program to a professional setting. Prerequisite: PubH 201, 202. (Fall, spring, and summer)
- 296 **Case Studies in Administrative Medicine (3)** Staff  
Analyses of problems and policies in health systems administration. Prerequisite: PubH 211, 213. Same as HSA 268. (Summer)
- 299 **Independent Study (3)** Staff  
Permission of program director required.

## Radiology

Chair R. M. Allman

Courses numbered 10 to 198 are open only to degree candidates in radiologic health sciences programs. The following courses are open only to off-campus students: Rad 40-41-42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99, 100.

- 10 **Ethics in Radiation Therapy and Nuclear Medicine Technology (1)** Staff  
Ethical issues related to the technologist's work with physicians and patients, including moral and legal responsibilities and the rapport expected of the technologist.
- 11 **Introduction to Radiation Therapy Technology (3)** Staff  
Introduction to hospital and departmental organization; roles and functions of the radiation therapy technologist. Emphasis on principles of radiation therapy treatment and procedures used in the treatment of cancer patients, including basic principles of patient care and nursing procedures.
- 12 **Care of the Terminally Ill Patient (2)** Staff  
Fundamental concepts of death and dying, including attitudes and experiences as they relate to the dying process. Emphasis on patient care and aseptic techniques associated with the radiology service.
- 14 **Radiation Physics I (2)** Staff  
Basic course in physics for students in the radiation therapy technology program. Standards of measure, metric measurement, laws of motion, weight, work, power,



- energy, and momentum. Introduction to the structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, decay schemes. Electrostatics and magnetism. Staff
- 15 **Radiation Physics II (3)**  
Continuation of Rad 14. Current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors. Applications of electronic principles to X-ray equipment and components, transformers, generators, motors, rectifiers, current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work. Staff
- 16-17-18 **Radiation Therapy Physics, Dosimetry, and Safety I-II-III (2-2-2)**  
Concepts of interaction of radiation with matter, emphasizing the photoelectric, Compton and pair-production effects, units of radiation, concepts of depth dose, isodose curves and tissue-air ratios for different energies, TSD and field size. Techniques of treatment planning, including wedge fields and compensators using  $CO_6$  units and megavoltage linear accelerators. Concepts of linear source dosimetry and computer treatment planning. Introduction to the dosimetry of electrons and neutrons. Concepts of radiation detection and safety as applied to radiation therapy, including effects of time, distance, and shielding. Staff
- 19 **Radiation Pathology (2)**  
Basic concepts of pathology. Emphasis on tumor pathogenesis and the biological and pathological effects of ionizing radiation in living organisms. Staff
- 20-21 **Radiation Therapy Techniques and Oncology I-II (3-3)**  
Management of patients with a variety of malignant diseases by radiotherapeutic techniques. Preparing the patient for treatment, patient positioning, and immobilization techniques. Staff
- 23 **Clinical Experience (1 to 4)**  
Students are assigned to a local health facility for 4 to 12 hours per week during the fall and spring semesters. Observation and some participation in the management of the patient undergoing radiation therapy. Staff
- 24 **Anatomy and Physiology Overview (1)**  
Review of the structure, function, and processes of the human body; major organ systems are considered. Staff
- 25 **Quality Assurance in Radiation Therapy Technology (2)**  
Quality assurance procedures, including review of patient charts, monitoring of equipment, and evaluation of treatment facilities. Staff
- 33 **Clinical Practicum (3 to 5)**  
Participation in treatment planning and therapeutic applications at a local health care facility, under supervision of an approved preceptor. Student gains experience in using a wide variety of technical procedures. Full-time program participation required for 15 weeks during the summer sessions. Admission by permission of instructor. Staff
- 40-41-42 **Clinical Training and Experience in X-ray Technology I-II-III (2-2-2)**  
Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems. Chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy. Staff
- 43 **Introduction to Nuclear Medicine Technology (3)**  
Provides the background for clinical work in nuclear medicine technology. Principles of patient care; federal and local regulations concerning radiation safety; introduction to radiopharmacy, instrumentation, and basic procedures of nuclear medicine technology. Course requirements include CPR certification. Staff
- 44-45-46 **Clinical Practicum I-II-III (3-3-3)**  
Supervised experience in procedures and methods of nuclear medicine technology, with emphasis on indications and contraindications, safety techniques, preparation and development of radiopharmaceuticals, research methods, and administrative procedures. Staff



- 50 **Radiographic Anatomy and Positioning II** (4) Staff  
Human anatomy and positioning as applied to radiologic technology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological. Positioning techniques are practiced in the laboratory.
- 51 **Radiographic Anatomy and Positioning IV** (4) Staff  
Basic positioning techniques, including those applicable to the upper and lower extremities, are studied and practiced, using radiographic machines, phantoms, and film-processing methods.
- 55-56 **Clinical Nuclear Medicine I-II** (3-3) Staff  
Study of routine procedures done in a nuclear medicine department. Aspects of anatomy, physiology, and pathology that relate to organ imaging, organ concentration-excretion measurements, and hematologic and dilution procedures.
- 59 **Competitive Binding Radioassay** (2) Staff  
Basic concepts of radioassay and procedures for any competitive binding radioassay. Specific concepts and procedure for T3, T4, and serum B-12 determinations; factors affecting those determinations and the interpretation of their results.
- 60 **Radiographic Technique** (4) Staff  
History and development of X-rays and X-ray tubes. Major factors affecting film quality. Quality assurance.
- 61 **Radiographic Anatomy and Positioning III** (4) Staff  
Techniques of radiography employing contrast media, fluoroscopy, spot films, body section radiography, pelvimetry, location of foreign body in the eye, and operating techniques. Prerequisite: Rad 60.
- 62 **Darkroom Procedures** (2) Staff  
Processing of film after exposure; care and handling of darkroom equipment; types of film, handling, and storage; mixing and handling of chemicals and the action of these chemicals in processing; effects of heat and cold on chemicals; diagnosis of improper developing techniques. Laboratory work.
- 66 **Radiopharmaceuticals** (3) Staff  
Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.
- 70 **Radiographic Physics I** (3) Staff  
Basic concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Electrostatics and magnetism. Laboratory work.
- 71 **Radiographic Physics II** (4) Staff  
Basic concepts of current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors. Applications of electronic principles to X-ray equipment and components, transformers, generators, motors, rectifiers, current-control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work.
- 72 **Physics of Nuclear Medicine** (3) Staff  
Introduction to properties of nuclei and nuclear models, forces, and reactions. Study of radioactive decay, ionization processes in matter, radiation dosage, and radionuclides in biology and medicine.
- 73 **Nuclear Instrumentation** (3) Staff  
Introduction to radiation detectors used in a nuclear medicine department, including dose calibrators, survey instruments, spectrometers, stationary cameras, and SPECT and PET instruments.
- 74 **Computer Applications in Nuclear Medicine Technology** (3) Staff  
Use of computers in imaging, radioimmunoassay, and the analysis of other clinical data in nuclear medicine. Lecture and laboratory.



**80 Mathematics of Radiology (3)**

Principles of mathematics as applicable to the physics of radiologic technology: use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian coordinate plane; slope of straight line; linear equations from given conditions; and graphic solution of two or more linear equations.

**90 Ethics in Radiologic Technology (1)**

Ethics of physician-technician-patient relationships. Responsibilities, both moral and legal, to physician and patient; the rapport expected of the technologist.

**91 Special Projects in Radiology (arr.)**

Independent study of an aspect of radiology determined by the student and the instructor. Students may register by petition only.

**95 Radiation Safety (2)**

Techniques and equipment design for reducing unnecessary radiographic exposure of the patient and technologist.

**96 Radiation Biology (3)**

Effects of ionizing radiation on various cells, tissues, organs, and the human body as a whole. Organic and inorganic molecules. Human immunity system. Effects on pregnancy and relative radiosensitivity of the developing embryo; possible genetic effects of radiation. Chronic and acute effects of radiation. Use and history of radiation in therapy; classification of neoplasms, types of therapy units, and treatments. Prerequisite: Rad 50, 70, 71.

**97 Radiographic Anatomy and Positioning V (4)**

Special radiographic procedures, including cerebral, abdominal, and cardiac angiography. Lecture and laboratory. Prerequisite: Rad 61, 71.

**99 Alternate Imaging Systems (3)**

Various modalities of radiographic imaging systems and types of equipment. Intensification screens, fluoroscopy, spot filming, image intensification, cinefluoroscopy, film changes, thermography, electron radiography, and computerized axial tomography. Prerequisite: Rad 60, 71, 95.

**100 Pathology (3)**

Radiographic pathology relevant to the radiologic technologist. Clinical description of the disease process and radiographic demonstrations.

**130 Mathematics of Radiology (3)**

Use of exponential and logarithm function, including multiplication, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions, linear equations, and the unknown; Cartesian coordinate plane; slope of a straight line; and linear equations from given conditions.

**140 Radiology Administration (4)**

Topics related to radiology management at the department level, including organizational behavior, planning, and control. Discussion of the logistics of managing a radiology section. Prerequisite: HSA 142, 153, 154, 170.

**145 Administrative Project: Diagnostic Radiology (3)**

For students concentrating in diagnostic radiology. Completion of a project for a radiology department, using administrative principles. Weekly seminars on current issues in management and leadership. Concurrent registration: Rad 140.

**147 Administrative Project: Nuclear Medicine (3)**

For students concentrating in nuclear medicine. Completion of a project for a nuclear medicine department, using administrative principles. Weekly seminars on current issues in management and leadership. Concurrent registration: Rad 140.

**149 Administrative Project: Radiation Therapy (3)**

For students concentrating in radiation therapy. Completion of a project for a radiation therapy department, using administrative principles. Weekly seminars on current issues in management and leadership. Concurrent registration: Rad 140.

**160 Computer Applications in Radiology (3)**

Administrative and clinical applications of the digital computer in radiology, with emphasis on the design, procurement, and implementation of computer systems. Students participate in team projects involving operational management or clinical systems, write a paper, and prepare a class presentation based on project results.



- 167 **Radiation Physics and Safety (3)** Rosenstein  
Concepts of matter, energy, and electromagnetic radiation. Mechanisms in the production of X-rays and X-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effects. Radiation detection and dosimetry; roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems. Prerequisite: Rad 130.
- 168 **Advanced Radiation Safety (3)** Miller  
Principles of radiation protection applicable to medical X-ray and other radioactive sources. Methods of calculating and measuring radiation doses. Safety procedures and regulations. Prerequisite: permission of instructor.
- 171 **Introduction to the Physics of Nuclear Medicine and Radiation Therapy (3)** McElroy  
Nuclear medicine concepts, radiopharmaceuticals, detection, measurement, imaging equipment, dosimetry, and *in vitro* kits. Radiation therapy methods, calibrations, checks, calculations. Regulations governing the clinical use of radiation. Emphasis on clinical applications, quality assurance methods, and magnetic aspects. Prerequisite: Rad 130.
- 175 **Physics of Radiological Imaging (3)** Butler  
Principles, design, and operation of diagnostic X-ray systems and components, including film and screens, fluoroscopic systems, computerized tomography, digital radiology, and mammography, with emphasis on producing quality radiographic images at the lowest radiation dose. Physics of ultrasound. Prerequisite: Rad 167.
- 180 **Special Projects in Radiology (arr.)** Faulkner  
For selected students in the radiological sciences and administration program who wish to pursue independent research on a current topic in radiologic technology, physics, or administration. Students must complete a written report on the project and may be required to give an oral presentation in an appropriate course.
- 190 **Radiation Biology (3)** Bradley  
Chronic and acute effects of ionizing radiation on various cells, tissues, and organs and on the body as a whole. Organic and inorganic molecules; the human immune system; effects of radiation on pregnancy and the relative radiosensitivity of the developing embryo; possible genetic effects of radiation.
- 195 **Quality Control in X-Ray Imaging (3)** Butler  
Laboratory course. Experience in quality assurance testing of processor, film, darkroom systems; X-ray generators and tubes; phototimers; fluoroscopic systems; and conventional and computerized tomography systems. Establishing, maintaining, and evaluating equipment-testing programs.
- 196 **Fundamentals of Magnetic Resonance Imaging (3)** Butler  
Introduction to magnetic resonance imaging, including physical principles, imaging principles, equipment design, siting requirements, clinical safety, quality assurance, image interpretation, special techniques, financial considerations, and future technical developments. Prerequisite: one year of college-level physics.
- 197 **Practicum in Magnetic Resonance Imaging (2)** Butler  
Students learn to operate a magnetic resonance imaging unit, screen and position patients, select appropriate pulse sequences, and evaluate image quality and artifacts; become familiar with specific characteristics of the clinical unit in use; and observe clinical interpretation. Prerequisite or concurrent registration: Rad 196.
- 198 **Practical Approach to Diagnostic Ultrasound (3)** Staff  
Introduction to diagnostic ultrasound, with emphasis on basic applications. Ultrasound physics, scanning fundamentals, cross-sectional anatomy, and approach techniques for all aspects of ultrasound, excluding echocardiograms and equipment design/purchase considerations. Prerequisite: clinical experience as a technician, nurse, or physician.
- 201 **Advanced Topics in Nuclear Magnetic Resonance (3)** Hoult  
Topics include generation of nuclear magnetic resonance signals, Bloch equations, rotating frame analysis, relaxation mechanisms, quadrature phase detection, chem-



- ical shift, receiver coil design, image encoding, slide selection shim coils, magnet design, data processing, quality assurance, and zonal and tesseral harmonics mapping. Prerequisite: permission of instructor.
- 383 **Clinical Radiology (5)** Allman, Jacobs, and Staff  
For the initial portion of the course, students work in a simulated reading room with a faculty member in a review of the American College of Radiology learning file of radiographs. Students then rotate through and observe various sections in the University Hospital department of radiology.
- 384 **Introduction to Radiology (5)** Shannon and Staff  
Scope, medical importance, and trends of medical imaging. Lectures on and clinical observation of general diagnostic radiology, vascular and interventional procedures, computed tomography, and nuclear medicine. Overview of imaging in clinical decision making.
- 385 **Nuclear Medicine (arr.)** Reba and Staff  
Introduction to the application of radiotracer techniques in clinical medicine and biomedical research. Participation as clinical nuclear medicine intern or as research assistant. Student is encouraged to become involved with one of the research projects of the division or in an independent investigation oriented toward pharmaceutical chemistry, computer applications, or patient care. University Hospital.
- 386 **Radiation Oncology (arr.)** Rogers, Ney  
Introduction to radiation oncology, including basic principles of radiation physics and biology as well as therapy techniques. Experience in management of patients with a variety of malignant diseases, with emphasis on diagnosis, staging, and treatment alternatives.
- 387 **Subspecialty Diagnostic Radiology (arr.)** Jacobs and Staff  
Subspecialty training in radiological diagnosis to prepare students for specialty medical training. Offerings include bone, pulmonary, gastrointestinal, urologic, obstetric and gynecologic, and neurologic subspecialties. Prerequisite: permission of department. University Hospital.
- 390-92 **Extramural Radiology Elective (arr.)** Staples and Staff  
Elective periods at other institutions.
- 400 **Diagnostic Radiology (arr.)** Ghased  
General radiography, fluoroscopy and nuclear medicine, special procedures, ultrasound and/or CT. Review and study of teaching image file. Washington Hospital Center.
- 401 **Diagnostic Radiology (arr.)** Jacobs  
Participation in general radiologic interpretation, nuclear radiology, special procedures, ultrasound, and CT. Review and study of teaching file. Daily conferences. Walter Reed Army Medical Center.
- 402 **Reading Chest Films (3)** Jacobs  
Two-week radiology elective designed to improve the physician's understanding of radiographic principles and diagnostic approaches, with emphasis on chest films.
- 403 **Reading Bone Films (3)** Jacobs  
Two-week radiology elective designed to improve the physician's understanding of radiographic principles and diagnostic approaches, with emphasis on bone films.

## Surgery

Chair R. G. DePalma

- 303 **Clinical Clerkship (10)** Hix  
Required for medical students. Eight weeks at University Hospital and National Naval Medical Center.
- 351 **Otolaryngology, Head and Neck Surgery (arr.)** Burgess  
Participation in clinical service involving inpatients and outpatients. Walter Reed Army Medical Center.



- 352 **Otolaryngology** (arr.) Thompson  
Inpatient and outpatient rotations; operating room experience. National Naval Medical Center.
- 353 **Otolaryngology, Head and Neck Surgery** (arr.) Wilson, Gulya  
Work-up and care of clinical and hospitalized patients. Participation in surgery and ER consultations. This course partially fulfills the surgical subspecialty requirement if the student did not have an ENT experience during the third-year surgery clerkship.
- 376 **Advanced Surgery** (5) Tsangaris  
Participation in total patient care, including operative procedures, under close supervision.
- 378 **Intensive Care Unit** (5) Fouty and Staff  
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular-thoracic, abdominal, and orthopaedic surgery. Washington Hospital Center.
- 379 **Transplantation Immunology** (arr.) Karmi  
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical-medical nephrology rounds. University Hospital.
- 383 **Endocrine Surgery** (arr.) Geelhoed  
Management of endocrine disorders. Emphasis on control of hyperfunction and neoplasms of the thyroid, parathyroid, adrenal, and pancreatic islet cell glands. Library and laboratory research and clinical exposure to surgical endocrinology. University and V.A. Hospitals.
- 384 **Thoracic/Cardiovascular Surgery** (5) Aaron  
Basic principles used in thoracic and cardiovascular surgery. Four-week elective periods. University Hospital and Medical Faculty Associates.
- 385 **Plastic and Reconstructive Surgery** (arr.) McGrath  
Experience in the full spectrum of reconstructive surgery in both children and adults, including congenital anomalies, cosmetic surgery, neoplasms of the head and neck, facial trauma, benign and malignant skin lesions, hand surgery, burns, microsurgery, and breast surgery. Responsibilities in the operating room, at the bedside, and in the clinic. University and Children's Hospitals.
- 389 **Surgical Preceptorship** (arr.) Tsangaris  
Care of general surgical patients as seen in private practice.
- 390-95 **Extramural Surgery Elective** (arr.)  
Elective periods at other institutions.
- 400 **Special Programs** (arr.) Tsangaris  
Special elective developed in consultation with department faculty.
- 401 **Peripheral Vascular Surgery** (arr.) Keshishian and Staff  
Introduction to the physiologic basis for an approach to peripheral vascular disease. Initial assignment to the chief cardiovascular technician in the noninvasive laboratory. Modern diagnostic techniques, including observations of contrast arteriography. Student then follows a patient from admission, through surgery, and into the postoperative period. Opportunity to participate in private office practice. Washington Hospital Center.
- 402 **Burns** (arr.) Jordan  
Participation in a nine-bed dedicated burn intensive care unit with an associated rehabilitation unit. Full-time attending.
- 403 **Peripheral Vascular Surgery** (5) Giordano and Staff  
General introduction to peripheral vascular surgery. Time spent in vascular laboratory, in learning the basic arteriovenous and cerebrovascular examinations, and in evaluating vascular patients in an office practice. Assignment to one of the surgical services, participating in management and care of patients and attending to them in the operating room, if appropriate.
- 404 **Experimental Surgery** (arr.) Geelhoed  
Projects in surgical research laboratories, employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigation include surgical endocrinology, transplantation, and cardiovascular physiology.



#### 405 Hand Surgery Clinic/Research (arr.)

Participation in care of patients of all ages, working closely with hand surgeons from orthopaedic and plastic surgical services. Basic approaches to diagnosis and treatment of a wide variety of hand disorders, including nerve injuries, arthritic conditions, congenital anomalies, fractures, vascular problems, and reconstructive techniques for these problems. Exposure to microsurgery. Participation in clinics, conferences, ward rounds, and operating room. Walter Reed Army Medical Center. Seyfer

#### 406 Plastic Surgery Clinic/Research (arr.)

Participation in care of patients and exposure to a wide variety of surgical problems in all age groups, ranging from congenital anomalies such as cleft lip/palate and syndactyly to complex reconstructive surgery for abdomino/thoracic wall defects, head and neck cancer, and extremity reconstruction. Cosmetic surgery involving face, eyelids, and other areas. Participation in combined orthopaedic/plastic surgery hand service. Experience in evaluation and treatment of conditions related to the upper extremity. Research opportunities. Student assists in microsurgical laboratory on a regular basis. Walter Reed Army Medical Center. Seyfer

## Urology

*Chair* H. C. Miller, Jr.

#### 302 Clinical Clerkship (3)

Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. University, V.A., Fairfax, and Children's Hospitals. Karmi

#### 381 Clinical Urology (5)

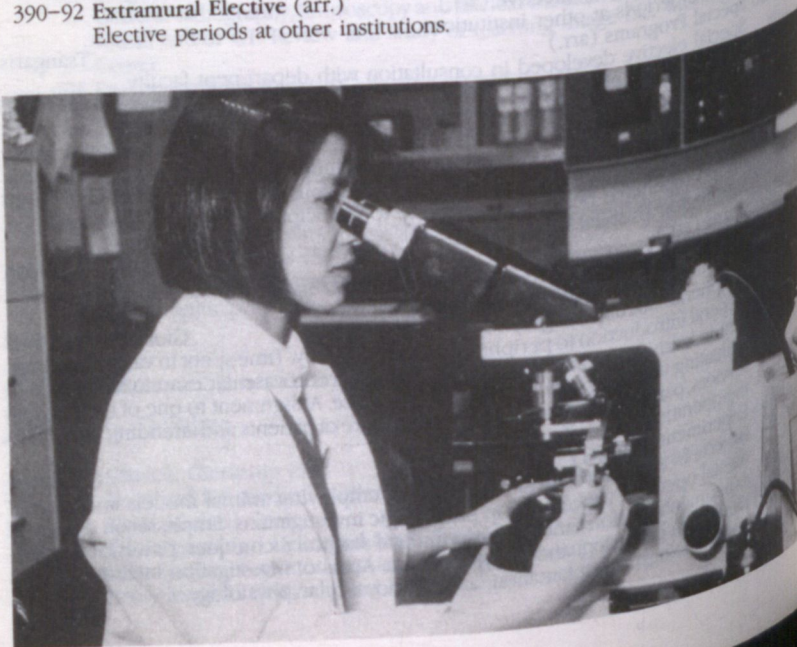
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. University, V.A., Children's, and Fairfax Hospitals. Karmi and Staff

#### 382 Clinical Urology (arr.)

Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. V.A. Hospital. Bensimon and Staff

#### 390-92 Extramural Elective (arr.)

Elective periods at other institutions.





## Faculty and Staff of Instruction\*

### Emeriti

- Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*  
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University
- John Pletch Adams, *Professor Emeritus of Orthopaedic Surgery and of Pediatrics*  
B.S. 1943, University of Missouri; M.D. 1945, Washington University
- Theodore Crandall Alford, *Professor Emeritus of Surgery*  
A.B. 1944, Haverford College; M.D. 1947, Johns Hopkins University
- Louis Katz Alpert, *Professor Emeritus of Medicine*  
B.S. 1928, M.D. 1932, Yale University
- Seymour Alpert, *Professor Emeritus of Anesthesiology*  
B.A. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center
- William Staton Anderson, *Professor Emeritus of Clinical Pediatrics*  
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University
- Robert Henry Barter, *Professor Emeritus of Obstetrics and Gynecology*  
B.S. 1937, M.D. 1940, University of Wisconsin
- Christian Virgil Cimmino, *Professor Emeritus of Clinical Radiology*  
A.B. 1937, Harvard University; M.D. 1941, Johns Hopkins University
- Charles Seymour Coakley, *Professor Emeritus of Anesthesiology*  
M.D. 1937, George Washington University
- William Hurlbert Cooper, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
B.A. 1946, Case Western Reserve University; M.D. 1949, George Washington University
- Leon Richard Culbertson, *Professor Emeritus of Urology*  
B.S. M.D. 1936, University of Virginia
- Abraham Wolfe Danish, *Professor Emeritus of Clinical Medicine*  
A.B. 1938, M.D. 1941, George Washington University
- Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University
- Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1931, Case Western Reserve University
- William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*  
B.A. 1927, Ph.D. 1933, Yale University
- James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
M.D. 1934, George Washington University
- Henry Dunlop Ecker, *Professor Emeritus of Clinical Medicine*  
B.S. 1936, M.D. 1940, University of Virginia
- Clayton Bernard Ethridge, *Professor Emeritus of Medicine*  
M.D. 1933, University of Virginia
- Henry Leon Feffer, *Professor Emeritus of Orthopaedic Surgery*  
B.A. 1939, Indiana University; M.D. 1942, Indiana University-Purdue University at Indianapolis
- James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Medicine*  
B.A. 1935, Indiana University; M.D. 1938, Indiana University at Indianapolis
- Marvin Peace Footer, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
B.A. 1938, M.D. 1942, George Washington University

\*The Faculty and Staff of Instruction listed here by department represent appointments current as of January 1989. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.



- James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*  
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University
- Frederick Chapman Green, *Professor Emeritus of Pediatrics and of Health Care Sciences*  
B.S. 1942, Indiana University at Bloomington; M.D. 1944, Indiana University—Purdue University at Indianapolis
- Robert Henry Groh, *Professor Emeritus of Clinical Neurology*  
B.S. 1935, M.D. 1937, University of Pittsburgh
- Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*  
B.A. 1933, M.D. 1936, George Washington University
- Murdock Head, *Airlie Professor Emeritus of Medical and Public Affairs*  
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; J.D. 1958, George Washington University
- Roy Hertz, *Research Professor Emeritus of Pharmacology*  
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University
- William Allen Howard, *Professor Emeritus of Clinical Pediatrics*  
M.D. 1934, Tulane University
- Vincent Michael Iovine, *Professor Emeritus of Clinical Surgery*  
B.S. 1931, Manhattan College; M.D. 1935, Columbia University
- Paula Reines Kaiser, *Associate Professor Emeritus of Anesthesiology*  
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New York
- Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*  
B.S. 1927, University of the South; M.D. 1937, George Washington University
- Calvin Trexler Klopp, *Professor Emeritus of Surgery*  
B.A. 1934, Swarthmore College; M.D. 1938, Harvard University
- Norman Clifford Kramer, *Professor Emeritus of Medicine*  
B.S. 1948, The Citadel; M.S. 1950, M.D. 1954, George Washington University
- Fred Leonard, *Research Professor Emeritus of Medicine and of Orthopaedic Surgery*  
B.S. 1938, University of Arkansas; M.S. 1942, Ph.D. 1947, Polytechnic Institute of New York
- Benjamin Manchester, *Professor Emeritus of Clinical Medicine*  
M.D. 1935, George Washington University
- William Laverne Marsh, *Professor Emeritus of Pathology and of Anesthesiology*  
B.S. 1942, Purdue University; M.D. 1946, State University of New York at Buffalo
- William Prentiss McKelway, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
A.B. 1943, Washington and Lee University; M.D. 1950, George Washington University
- Frank Nelson Miller, Jr., *Professor Emeritus of Pathology*  
B.S. 1943, M.D. 1948, George Washington University
- George Nordlinger, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
B.A. 1918, M.D. 1922, George Washington University
- Thomas Martin Peery, *Professor Emeritus of Pathology*  
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina
- Leonard Theodore Peterson, *Professor Emeritus of Clinical Orthopaedic Surgery*  
B.A., B.S. 1928, M.D. 1931, University of Minnesota
- Howard Clemeth Pierpont, *Associate Professor Emeritus of Surgery*  
A.B. 1939, Marietta College; M.D., C.M. 1943, McGill University, Canada
- Hubert Vincent Pipberger, *Professor Emeritus of Clinical Engineering and of Medicine*  
B.A. 1938, Deutsches Kollege, Germany; M.D. 1951, Rheinische Friedrich Wilhelms University, Germany
- Herbert Pollack, *Professor Emeritus of Clinical Medicine (Biochemistry)*  
B.A. 1925, Washington and Lee University; M.D. 1929, Cornell University; Ph.D. 1933, University of Minnesota
- Neel Jack Price, *Professor Emeritus of Clinical Obstetrics and Gynecology*  
A.B. 1939, B.S. 1940, M.D. 1942, University of Oklahoma



- Lawrence Elias Putnam, *Professor Emeritus of Clinical Medicine*  
BA 1930, M.D. 1934, Harvard University
- Jack Jacob Rheingold, *Professor Emeritus of Clinical Medicine*  
BA 1936, University of Alabama; M.B. 1940, M.D. 1941, University of Cincinnati
- Hugo Victor Rizzoli, *Professor Emeritus of Neurological Surgery*  
AB 1936, M.D. 1940, Johns Hopkins University
- Mary Louise Robbins, *Professor Emeritus of Microbiology*  
BA 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University
- Monroe James Romansky, *Professor Emeritus of Medicine*  
AB 1933, University of Maine; M.D. 1937, University of Rochester
- Arthur Bernard Rosenbaum, *Professor Emeritus of Clinical Medicine and of Clinical Health Care Sciences*  
B.S. 1931, City University of New York, City College; M.D. 1935, New York University
- Thomas Stone Sappington, *Professor Emeritus of Clinical Medicine*  
BA 1937, M.D. 1941, Harvard University
- Bertram Jacob Lyons Sauerbrunn, *Professor Emeritus of Clinical Radiology*  
B.S. 1936, Lafayette College; M.D. 1940, Union University
- Benjamin Williams Smith, *Professor Emeritus of Biochemistry*  
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University
- Nicholas Patrick D. Smyth, *Professor Emeritus of Clinical Surgery*  
MS 1948, M.B., Ch.B. 1949, University College, Dublin; M.S. 1954, University of Michigan
- Richard Saxon Snell, *Professor Emeritus of Anatomy and Orthopaedic Surgery*  
MB, B.S. 1949, Ph.D. 1955, M.D. 1961, University of London
- Harold Stevens, *Professor Emeritus of Neurology*  
B.S. 1933, Pennsylvania State University; M.A. 1934, Ph.D. 1937, M.D. 1941, University of Pennsylvania
- Donald Harrison Stubbs, *Professor Emeritus of Clinical Anesthesiology*  
BA 1929, M.A. 1931, M.D. 1932, George Washington University
- Irene Gorski Tamagna, *Professor Emeritus of Medicine*  
M.D. 1943, Medical College of Pennsylvania
- Ira Rockwood Telford, *Professor Emeritus of Anatomy*  
BA 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University
- Charles Waters Thompson, *Professor Emeritus of Clinical Medicine*  
M.D. 1941, George Washington University
- Janet Graeme Travell, *Professor Emeritus of Clinical Medicine*  
BA 1922, Wellesley College; M.D. 1926, Cornell University
- Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*  
BA 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan
- Robert James Van Houten, *Professor Emeritus of Anesthesiology*  
B.S. 1950, Albright College; M.D. 1954, Hahnemann Medical College
- James Christopher Walsh, Jr., *Professor Emeritus of Clinical Obstetrics and Gynecology*  
BA 1941, M.D. 1945, Georgetown University
- James Winston Watts, *Professor Emeritus of Neurological Surgery*  
B.S. 1924, Virginia Military Institute; M.D. 1928, University of Virginia
- Thomas Glenn Webster, *Professor Emeritus of Psychiatry and Behavioral Sciences*  
AB 1946, Fort Hays State University; M.D. 1949, Wayne State University
- Jonathan Marshall Williams, *Professor Emeritus of Clinical Neurological Surgery*  
B.S. in Med 1936, Loyola University of Chicago; M.D. 1938, University of Chicago

## Active

## Anatomy

- Ernest Narinder Albert, *Professor of Anatomy*  
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University



Frank Duane Allan, *Professor of Anatomy*

B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University

Ronald Carl Bohn, *Associate Professor of Anatomy*

B.S. 1973, M.S. 1976, Pennsylvania State University; Ph.D. 1980, State University of New York Upstate Medical Center

Milton Wilfred Brightman, *Professorial Lecturer in Anatomy*

B.S. 1945, M.A. 1948, University of Toronto; Ph.D. 1954, Yale University

Joseph Amedeo Di Paolo, *Associate Professorial Lecturer in Anatomy*

A.B. 1948, Wesleyan University; M.S. 1949, Case Western Reserve University; Ph.D. 1951, Northwestern University

Mary Frances Ericksen, *Associate Professorial Lecturer in Anatomy*

B.A. 1947, Indiana University; M.A. 1957, Columbia University; Ph.D. 1973, George Washington University

Barbara Gilson Hoffman, *Visiting Associate Professor of Anatomy*

B.A. 1968, Temple University; Ph.D. 1975, Thomas Jefferson University

Kurt Edward Johnson, *Professor of Anatomy*

B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Thomas Nick Johnson, *Professor of Anatomy*

B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

Marilyn Jean Koering, *Professor of Anatomy*

B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Janette Marilyn Krum, *Special Lecturer in Anatomy*

B.S. 1977, Cornell University; Ph.D. 1987, George Washington University

Luz Paltan Mangurian, *Special Lecturer in Anatomy*

B.S. 1968, University of Pittsburgh; M.S. 1981, American University; Ph.D. 1986, George Washington University

Kenna Dale Peusner, *Associate Professor of Anatomy*

B.S. 1968, Simmons College; Ph.D. 1974, Harvard University

Jeffrey Mark Rosenstein, *Associate Professor of Anatomy*

B.A. 1971, Kent State University; Ph.D. 1976, Pennsylvania State University

Francis P. Schulter-Ellis, *Associate Professorial Lecturer in Anatomy*

B.S. 1952, Birmingham-Southern College; M.S. 1954, Emory University; Ph.D. 1972, George Washington University

Frank James Slaby, *Associate Professor of Anatomy*

B.S. 1965, California Institute of Technology; Ph.D. 1971, University of California, Berkeley

Douglas Henry Ubelaker, *Professorial Lecturer in Anatomy*

B.A. 1968, Ph.D. 1973, University of Kansas

Raymond John Walsh, *Associate Professor of Anatomy*

B.S. 1969, University of Massachusetts; Ph.D. 1978, Tufts University

## Anesthesiology

Michael David Abramowitz, *Associate Clinical Professor of Anesthesiology*

M.B., Ch.B. 1972, University of Witwaterstrand, South Africa

Leonard Bachman, *Clinical Professor of Anesthesiology and of Pediatrics*

B.S. 1946, Franklin and Marshall College; M.D. 1949, University of Maryland

Peter Hartwell Bagley, *Adjunct Assistant Professor of Anesthesiology*

B.A. 1975, Columbia University; M.D. 1980, George Washington University

Francis Joseph Balestrieri, *Assistant Clinical Professor of Anesthesiology*

B.S. 1967, D.D.S. 1971, M.D. 1977, Georgetown University

Matthew Joseph Becker, *Assistant Professor of Anesthesiology and of Pediatrics*

B.S. 1971, Massachusetts Institute of Technology; M.D. 1974, Duke University

Janice Bitetti, *Assistant Professor of Anesthesiology*

B.A. 1975, Wellesley College; M.D. 1979, Columbia University

Jack Galen Bray, Jr., *Assistant Clinical Professor of Anesthesiology*

B.S. 1979, University of Redlands; M.D. 1983, University of Kansas



- Lynn M. Broadman, *Assistant Professor of Anesthesiology and of Pediatrics*  
BA 1962, Miami University; M.D. 1974, Medical College of Ohio
- May Lin Chin, *Assistant Professor of Anesthesiology*  
MB, B.S. 1975, University of Melbourne
- Leovino Diego Duran, *Assistant Clinical Professor of Anesthesiology*  
BA 1959, M.D. 1964, University of St. Thomas (Philippines)
- Basil Elias Economopoulos, *Associate Clinical Professor of Anesthesiology*  
M.D. 1962, National University of Athens, Greece
- Sol S. Edelstein, *Associate Clinical Professor of Anesthesiology*  
B.S. 1968, M.D. 1972, Wayne State University
- James Francis English, *Assistant Clinical Professor of Anesthesiology*  
B.S. 1975, B.S. 1978, Boston College; M.D. 1983, Georgetown University
- Burton Seymour Epstein, *Seymour Alpert Professor of Anesthesiology; Professor of Pediatrics*  
BA 1954, M.D. 1957, George Washington University
- Richard Mark Epstein, *Assistant Clinical Professor of Anesthesiology*  
B.S. 1973, M.D. 1977, University of Maryland
- Alan I. Fields, *Associate Professor of Anesthesiology and of Pediatrics*  
M.D. 1970, State University of New York Downstate Medical Center
- Gerald Goldstein, *Assistant Clinical Professor of Anesthesiology*  
B.S. 1973, M.D. 1977, University of Maryland
- Rafat Samy Hannallah, *Professor of Anesthesiology and of Pediatrics*  
MB, Ch.B. 1966, Cairo University, Egypt
- Patricia Hartwell, *Assistant Professor of Anesthesiology*  
BA 1977, Johns Hopkins University; M.D. 1981, University of New Mexico
- Peter R. Holbrook, *Professor of Anesthesiology and of Pediatrics*  
BA 1966, Yale University; M.D. 1970, University of Pennsylvania
- Dongzin Hur, *Assistant Clinical Professor of Anesthesiology*  
M.D. 1973, Catholic Medical College, Korea
- Maya Tolani Karna, *Assistant Professor of Anesthesiology and of Pediatrics*  
MB, B.S. 1961, M.G.M. Medical College, India
- Marie-Louise Levy Kennedy, *Associate Professor of Anesthesiology*  
B.S. 1943, College de Ville Franche, De Rouergue, France; M.D. 1952, Strasbourg Medical School, France
- Chul Wha Kim, *Assistant Clinical Professor of Anesthesiology*  
M.D. 1967, Yonsei University, Korea
- William A. Knaus, *Professor of Anesthesiology and Research Professor of Computer Medicine*  
B.S. 1968, Widener College; M.D. 1972, West Virginia University
- James Frederick Koch, *Assistant Clinical Professor of Anesthesiology*  
B.S. 1977, University of Delaware; M.D. 1981, University of Chicago
- Nancy Junghee Kwon, *Assistant Professor of Anesthesiology*  
M.D. 1975, Ewha Womans University, Korea
- Don Seung Lee, *Associate Professor of Anesthesiology*  
M.D. 1966, Catholic Medical College, Korea
- Manfred Wilhelm Lichtmann, *Professor of Anesthesiology*  
B.S. 1954, Wagner College; M.D. 1973, Thomas Jefferson University
- Mollyann Green March, *Assistant Professor of Anesthesiology*  
BA 1973, Boston University; M.D. 1981, Medical College of Pennsylvania
- Paul Mazel, *Professor of Pharmacology and of Anesthesiology*  
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1955, Trinity University; Ph.D. 1960, Vanderbilt University
- Willis Alexander McGill II, *Associate Professor of Anesthesiology and of Pediatrics*  
B.S. 1963, Westminster College; M.D. 1967, University of Pittsburgh
- Brian Jay McGrath, *Assistant Professor of Anesthesiology*  
BA 1977, State University of New York at Albany; M.D. 1982, Union University



- Gertrud Weber Mergner, *Associate Professor of Anesthesiology*  
M.D. 1967, University of Iowa
- George Albert Morales, *Professor of Anesthesiology and of Neurological Surgery*  
B.S. 1947, M.D. 1951, University of Mexico
- Lucille Ann Mostello, *Assistant Professor of Anesthesiology and of Pediatrics*  
B.A. 1966, Seton Hall University; M.D. 1970, Johns Hopkins University
- Thomas John Nassif, *Associate Professor of Anesthesiology*  
B.A. 1958, West Virginia University; M.D. 1962, University of Pennsylvania
- John Stephen Naulty, *Associate Professor of Anesthesiology and of Obstetrics and Gynecology*  
B.A. 1968, Duke University; M.D. 1972, Thomas Jefferson University
- Honorato F. Nicodemus, *Adjunct Associate Professor of Anesthesiology*  
M.D. 1962, Far Eastern University, Manila
- Ramesh I. Patel, *Assistant Professor of Anesthesiology and of Pediatrics*  
M.B., B.S. 1975, University of Baroda, India
- Murray Michael Pollack, *Professor of Anesthesiology and of Pediatrics*  
A.B. 1970, University of Rochester; M.D. 1974, Yeshiva University
- Thomas Gilman Rainey, *Adjunct Associate Professor of Anesthesiology*  
A.B. 1970, M.D. 1974, Duke University
- Fernando Gabriel Resano, *Assistant Clinical Professor of Anesthesiology*  
M.D. 1970, University of Buenos Aires, Argentina
- Linda Jo Rice, *Assistant Professor of Anesthesiology and of Pediatrics*  
B.S. 1973, M.D. 1977, University of Kentucky
- Michael John Shaffer, *Professor of Anesthesiology and of Health Services Administration*  
B.S.E.E. 1949, Leeds University, England; M.S. 1974, D.Sc. 1981, George Washington University
- Mohammad B.G. Shahvari, *Associate Professor of Anesthesiology*  
M.D. 1968, Pahlavi University, Iran; M.S. 1973, Temple University
- John Peter Swope, *Adjunct Associate Professor of Anesthesiology and of Health Care Sciences*  
B.S. 1958, U.S. Naval Academy; M.D. 1966, Georgetown University; M.S. 1970, Case Western Reserve University
- Susan Thomas Verghese, *Assistant Professor of Anesthesiology and of Pediatrics*  
M.B., B.S. 1975, Christian Medical College, India
- Herbert D. Weintraub, *Professor of Anesthesiology*  
B.A. 1950, New York University; M.A. 1958, M.B., Ch.B. 1959, Oxford University
- Leila Greiss Welborn, *Associate Professor of Anesthesiology and of Pediatrics*  
M.B., Ch.B. 1967, Cairo University, Egypt
- John Franklin Williams, Jr., *Assistant Professor of Anesthesiology*  
B.A. 1970, Boston University; M.Sc. 1973, London School of Economics and Political Science; M.P.H. 1975, Yale University; M.D. 1979, George Washington University
- Scott Brian Wurm, *Assistant Professor of Anesthesiology*  
B.S. 1982, City University of New York, City College; M.D. 1984, State University of New York Upstate Medical Center
- Jack Evans Zimmerman, *Professor of Anesthesiology and of Medicine*  
B.S. 1960, University of Maryland; M.D. 1964, George Washington University

## Biochemistry and Molecular Biology

- Elizabeth Potts Anderson, *Professorial Lecturer in Biochemistry*  
A.B. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1950, Stanford University
- John Martyn Bailey, *Professor of Biochemistry*  
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales
- Fritz Daguillard, *Adjunct Associate Professor of Biochemistry*  
M.D. 1961, University of Haiti; M.P.H. 1965, Harvard University; Ph.D. 1969, McGill University, Canada



- Peter Harvey Fishman, *Professorial Lecturer in Biochemistry*  
B.S. 1961, Massachusetts Institute of Technology; M.S. 1967, Ph.D. 1970, George Washington University
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 A.B. 1966, College of the Holy Cross; M.S. 1970, Ph.D. 1972, University of Illinois at Chicago Circle



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M.S. 1966, University of Tel Aviv, Israel; Ph.D. 1979, University of Notre Dame
- Melvin Reich, *Professor of Microbiology*  
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers University
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M.D., Ph.D. 1957, Northwestern University
- Gerald Virgil Stokes, *Associate Professor of Microbiology*  
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## Neurological Surgery

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BA 1943, M.D. 1945, University of Virginia
- Bruce Jorge Ammerman, *Clinical Professor of Neurological Surgery*  
BA 1969, Case Western Reserve University; M.D. 1972, George Washington University
- Harvey Hirsch Ammerman, *Clinical Professor of Neurological Surgery*  
B.S. 1939, M.D. 1943, George Washington University
- Vernon W. Armbrustmacher, *Professorial Lecturer in Neurological Surgery*  
M.D. 1984, University of Michigan
- Charles Jules Azzam, *Clinical Instructor in Neurological Surgery*  
M.D. 1979, Saint Joseph University, Lebanon
- John William Barrett, *Assistant Clinical Professor of Neurological Surgery*  
M.D. 1958, George Washington University
- Jerald Jack Bernstein, *Research Professor of Neurological Surgery and of Physiology*  
BA 1955, City University of New York, Hunter College; M.S. 1957, Ph.D. 1959, University of Michigan
- Edward Bernard Byrd, *Assistant Clinical Professor of Neurological Surgery*  
BA 1963, M.D. 1965, George Washington University
- F. Donald Cooney, *Clinical Professor of Neurological Surgery*  
B.S. 1959, King's College (Pennsylvania); M.D. 1963, University of Pittsburgh
- David Oliver Davis, *Professor of Radiology, of Neurology, and of Neurological Surgery*  
B.S. 1954, University of Illinois; M.D. 1958, St. Louis University
- Michael William Dennis, *Clinical Professor of Neurological Surgery*  
BA 1965, Brown University; M.D. 1969, Yale University
- Giovanni Di Chiro, *Clinical Professor of Neurological Surgery*  
M.D. 1949, University of Naples, Italy
- Delbert Eugene Evans, *Associate Professor of Neurological Surgery*  
BA 1963, Columbus Union College; M.S. 1966, American University; Ph.D. 1973, Georgetown University
- Barton Lucius Guthrie, *Assistant Professor of Neurological Surgery*  
B.S. 1976, M.D. 1980, University of Alabama in Birmingham
- Robert David Harris, *Associate Clinical Professor of Neurological Surgery*  
B.S. 1966, Louisiana State University; M.D. 1970, Medical College of Virginia of Virginia Commonwealth University; Ph.D. 1982, University of Minnesota
- Donald Gerard Hope, *Clinical Instructor in Neurological Surgery*  
B.S. 1978, Villanova University; M.D. 1982, University of Maryland
- Norman Harold Horwitz, *Professor of Neurological Surgery*  
AB 1945, Princeton University; M.D. 1948, Columbia University
- Arthur Proctor Hustead, *Clinical Professor of Neurological Surgery*  
B.S. 1949, M.D. 1952, Yale University
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M.D. 1974, University of Tehran, Iran
- Dennis Lee Johnson, *Associate Professor of Neurological Surgery and of Pediatrics*  
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M.B., Ch.B. 1973, Mosul University, Iraq
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B.A. 1964, M.D. 1968, Northwestern University; Ph.D. 1979, George Washington University
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B.S. 1960, M.D. 1964, Case Western Reserve University
- Edward R. Laws, Jr., *Professor of Neurological Surgery*  
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- David C. McCullough, *Professor of Neurological Surgery and of Pediatrics*  
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- George Albert Morales, *Professor of Anesthesiology and of Neurological Surgery*  
B.S. 1947, M.D. 1951, University of Mexico
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M.D. 1953, King Edward Medical College, India; M.A. 1960, Oxford University
- Thomas Glenn Pait, *Clinical Instructor in Neurological Surgery*  
B.S. 1973, University of Florida; M.D. 1981, George Washington University
- Morris Wade Pulliam, *Associate Clinical Professor of Neurological Surgery*  
M.D. 1966, Washington University
- Frederick Tovi Schwartz, *Associate Clinical Professor of Neurological Surgery*  
B.A. 1965, American International College; M.D. 1969, George Washington University
- Bernard Stopak, *Associate Clinical Professor of Neurological Surgery*  
B.S. 1959, University of Maryland; M.D. 1970, University of Montpellier, France
- Roger Ivo Von Hanwehr, *Assistant Clinical Professor of Neurological Surgery*  
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## Neurology

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- Marta Ewa Archutowska-Kempka, *Adjunct Assistant Professor of Neurology*  
M.D. 1971, Higher School of Medicine, Poland
- Brian Howard Avin, *Assistant Clinical Professor of Neurology*  
B.S. 1968, Marietta College; M.D. 1972, Chicago Medical School
- Andrew Jeffrey Barbash, *Assistant Clinical Professor of Neurology*  
B.A. 1975, Bowdoin College; M.D. 1981, Northwestern University
- Ann Birnbaum Barnet, *Professor of Neurology and of Pediatrics*  
A.B. 1951, Sarah Lawrence College; M.D. 1956, Harvard University
- Michael E. Batipps, *Assistant Clinical Professor of Neurology*  
B.S. 1968, M.D. 1972, Howard University
- Peter G. Bernad, *Assistant Clinical Professor of Neurology*  
B.A. 1970, M.D. 1974, McGill University, Canada
- V. John Blazina, *Adjunct Associate Professor of Neurology*  
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- Carmen Keith Conners, *Professor of Psychiatry and Behavioral Sciences and of Pediatrics and Research Professor of Neurology*  
B.A. 1953, University of Chicago; M.A. 1955, Oxford University; Ph.D. 1960, Harvard University
- Joan Adrienne Conry, *Assistant Professor of Neurology and of Pediatrics*  
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- David Oliver Davis, *Professor of Radiology, of Neurology, and of Neurological Surgery*  
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- Miriam Maltinskis Davis, *Assistant Clinical Professor of Neurology and of Pediatrics*  
 M.D. 1957, University of Buenos Aires, Argentina
- Kenneth William Eckmann, *Assistant Clinical Professor of Neurology*  
 B.A. 1974, University of California, Berkeley; M.S. 1977, Massachusetts Institute of Technology; M.D. 1981, Harvard University
- Richard Nathan Edelson, *Associate Clinical Professor of Neurology*  
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 M.D. 1977, George Washington University
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- Alan Jerry Friedman, *Adjunct Assistant Professor of Neurology*  
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- Benjamin Mark Frishberg, *Clinical Instructor in Neurology*  
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 M.B., B.S. 1975, University of the West Indies
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## Obstetrics and Gynecology

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- Israel Alter, *Assistant Clinical Professor of Obstetrics and Gynecology*  
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L.R.C.S. 1952, Royal College of Surgeons, Edinburgh
- Robert Emil Badwey, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1955, Franklin and Marshall College; M.D. 1959, University of Pittsburgh
- Bernard Alvin Band, *Associate Clinical Professor of Obstetrics and Gynecology*  
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- Harry Carl Beaver, *Associate Clinical Professor of Obstetrics and Gynecology*  
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- Arthur Abbe Becker, *Clinical Professor of Obstetrics and Gynecology*  
B.S. 1956, City University of New York, City College; M.D. 1961, University of Iowa
- Samuel Michael Belinsky, *Clinical Professor of Obstetrics and Gynecology*  
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- John David Berryman, *Assistant Clinical Professor of Obstetrics and Gynecology*  
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A.B. 1978, Washington University; M.D. 1983, Temple University
- Kenneth Alan Blank, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1978, Georgetown University; M.D. 1982, University of Maryland
- Charles Russell Boice, *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1973, Loma Linda University
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B.S. 1975, Rensselaer Polytechnic Institute; M.D. 1980, Albany Medical College
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B.S. 1968, Muskingum College; M.D. 1973, George Washington University
- James McClay Close, *Clinical Professor of Obstetrics and Gynecology*  
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B.A. 1967, Vassar College; M.D. 1977, George Washington University
- William Francis Colliton, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1948, Georgetown University
- Thomas Alfred Cook, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1949, University of Virginia
- Stewart Dallas Cooley, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1957, Ohio State University; M.D. 1961, University of Cincinnati
- Wayne Douglas Cooper, *Assistant Clinical Professor of Obstetrics and Gynecology*  
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- Mary Elizabeth Cutting, *Assistant Clinical Professor of Obstetrics and Gynecology*  
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- M. Margaret Rantz Davis, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1973, Bryn Mawr College; M.D. 1977, University of Virginia
- Sebastian James Dispenza, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1974, University of Virginia
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B.S. 1979, Belmont College; M.D. 1983, George Washington University
- Oscar Irving Dodek, Jr., *Clinical Professor of Obstetrics and Gynecology*  
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B.S. 1968, Wilberforce University; M.B.A. 1973, Michigan State University; M.D. 1977, University of Nebraska
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B.S. 1966, Marquette University; M.D. 1970, George Washington University
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B.S. 1972, M.D. 1978, George Washington University
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- Richard Vernon Erkenbeck, *Assistant Clinical Professor of Obstetrics and Gynecology*  
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- Louis Earl Fettig, *Associate Clinical Professor of Obstetrics and Gynecology*  
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- Nicolae Filipescu, *Professor of Chemistry and Special Lecturer in Obstetrics and Gynecology*  
Ph.D. 1957, University of Industrial Chemistry, Polytechnic Institute, Romania; Ph.D. 1964, M.D. 1975, George Washington University
- Mary Ann Fletcher, *Associate Professor of Pediatrics and of Obstetrics and Gynecology*  
B.S. 1965, University of Puget Sound; M.D. 1969, Washington University
- Julius Fogel, *Assistant Clinical Professor of Obstetrics and Gynecology*  
M.D. 1937, University of Virginia
- Richard Neil Footer, *Clinical Instructor in Obstetrics and Gynecology*  
B.S. 1976, University of Miami; M.D. 1981, George Washington University
- Andrew A. Freier, *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1947, University of London; M.R.C.O.G. 1957, Royal College of Obstetricians and Gynecologists; F.R.C.S. 1960, Royal College of Surgeons, Canada
- Arnold Jay Friedman, *Associate Professor of Obstetrics and Gynecology*  
B.A. 1969, City University of New York, Queens College; M.D. 1973, New York University
- Edward Elias Gahres, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1950, Rutgers University; M.S. 1951, George Washington University; M.D. 1958, University of Virginia
- Charles Richard Alsop Gilbert, *Associate Clinical Professor of Obstetrics and Gynecology*  
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B.A. 1971, M.D. 1975, George Washington University
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B.S. 1959, Alfred University; M.D. 1963, Howard University
- Thomas Hamlin Gresinger, *Assistant Clinical Professor of Obstetrics and Gynecology*  
A.B. 1957, Williams College; M.D. 1961, George Washington University
- Jay M. Grodin, *Clinical Professor of Obstetrics and Gynecology*  
B.A. 1961, Hobart and William Smith Colleges; M.D. 1965, Thomas Jefferson University
- John Henry Grossman III, *Professor of Obstetrics and Gynecology and of Microbiology*  
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- Liam Haim, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1951, M.D. 1955, Duke University
- Jerry Leborn Hall, *Assistant Professor of Obstetrics and Gynecology (Reproductive Endocrinology)*  
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- Achim Jurgen Heintze, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1967, University of Hamburg
- B. Frederick Helmkamp, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1967, Brown University; M.D. 1971, Cornell University
- Elisabeth Kremenak Herz, *Associate Clinical Professor of Obstetrics and Gynecology and of Psychiatry and Behavioral Sciences*  
M.D. 1951, University of Vienna, Austria
- Peter Spencer Heyl, *Assistant Professor of Obstetrics and Gynecology*  
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- Sherilynn Joan Hummel, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1973, University of Minnesota; M.D. 1977, University of Illinois
- Sara Louise Imershein, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1976, University of Pennsylvania; M.D. 1980, Emory University
- Nelson Benito Isada, *Assistant Professor of Obstetrics and Gynecology and of Medicine*  
M.D. 1978, State University of New York at Buffalo
- Ronald David Jacobs, *Clinical Instructor in Obstetrics and Gynecology*  
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B.S. 1956, Lycee Philippe Guerrier; M.D. 1962, Universite d'Etat d'Haiti
- Marilyn Concetta Jerome, *Associate Clinical Professor of Obstetrics and Gynecology*  
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- Alfred N. Khoury, *Assistant Professor of Obstetrics and Gynecology*  
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B.S. 1962, Saint Joseph's University; M.D. 1963, M.A. 1965, Temple University
- Burt Allan Littman, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1973, Clark University; M.D. 1977, Georgetown University
- Leon McNeely Liverett, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1943, Butler University; M.D. 1945, Indiana University
- John William Lyles, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.M.E. 1954, Cornell University; M.D. 1970, George Washington University
- Richard Sheldon Margolis, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1965, Pennsylvania State University; M.D. 1969, George Washington University
- David Mervyn Margulies, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1956, Columbia University; M.D. 1961, Northwestern University
- Stanley C. Marinoff, *Clinical Professor of Obstetrics and Gynecology*  
A.B. 1958, University of Pennsylvania; M.D. 1962, University of Health Sciences/Chicago Medical School  
M.P.H. 1970, Harvard University
- John Lloyd Marlow, *Assistant Professor of Obstetrics and Gynecology*  
B.S. 1957, Brigham Young University; M.D. 1961, George Washington University
- Leon Alphonse Martel, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1947, Georgetown University
- Dean Harrington Martin, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1950, George Washington University



- Larry McGowan, *Professor of Obstetrics and Gynecology*  
B.S. 1950, Millikin University; B.S. in Med. 1952, M.D. 1954, University of Illinois
- Imad S. Mufarrij, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1973, M.S. 1975, M.D. 1980, American University of Beirut, Lebanon
- Michael Andrew Murphy, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1976, Franklin and Marshall College; M.D. 1980, Thomas Jefferson University
- John Stephen Naulty, *Associate Professor of Anesthesiology and of Obstetrics and Gynecology*  
B.A. 1968, Duke University; M.D. 1972, Thomas Jefferson University
- Esfand Steven Nawab, *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1961, Dr. Med. 1963, University of Dusseldorf, Germany
- Keith Henderson Neblett, *Clinical Instructor in Obstetrics and Gynecology*  
M.D. 1970, Howard University
- Norman Morris Neches, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1964, Cornell University; M.D. 1968, State University of New York Downstate Medical Center
- Lawrence Merle Nelson, *Assistant Professor of Obstetrics and Gynecology*  
B.S. 1969, Westminster College (Pennsylvania); M.D. 1973, University of Pittsburgh
- Richard S. Newman, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1974, Tufts University; M.D. 1978, George Washington University
- Barbara M. Nies, *Instructor in Obstetrics and Gynecology*  
B.A. 1980, Mount Holyoke College; M.D. 1984, Michigan State University
- Ronald Julian Orleans, *Assistant Clinical Professor of Obstetrics and Gynecology*  
A.B. 1965, Franklin and Marshall College; M.D. 1969, George Washington University
- Adam Ostrzenski, *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1966, Ph.D. 1970, Academy of Medicine at Wroclaw, Poland
- John C. Pan, *Clinical Professor of Obstetrics and Gynecology*  
B.S. 1966, University of Notre Dame; M.D. 1970, George Washington University
- John Douglas Paulson, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1968, M.D. 1971, University of Virginia
- Walter Reams Perkins, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1957, University of Richmond; M.D. 1961, Medical College of Virginia of Virginia Commonwealth University
- David Neil Powers, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1973, Dartmouth College; M.D. 1977, University of Pennsylvania
- Peter Demetrios Protos, *Associate Clinical Professor of Obstetrics and Gynecology*  
M.D. 1958, University of Athens, Greece
- Louis Quain Pugsley, *Clinical Professor of Obstetrics and Gynecology*  
A.B. 1954, Hamilton College; M.D. 1958, Cornell University
- Luis Carlos Radice, *Assistant Clinical Professor of Obstetrics and Gynecology*  
M.D. 1957, University of Buenos Aires, Argentina
- Gerald Robert Renzi, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1976, Georgetown University; M.D. 1980, Howard University
- Manjit Kaur Risam, *Clinical Instructor in Obstetrics and Gynecology*  
M.B., B.Sc. 1971, Delhi University, India
- Herbert Ray Roberts, *Clinical Instructor in Obstetrics and Gynecology*  
B.S. 1970, U.S. Military Academy; M.D. 1976, University of Missouri
- Albert Irving Robins, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1957, George Washington University; M.D. 1941, Georgetown University
- Charles Clanton Rogers, *Professor of Radiology (Radiation Therapy) and of Obstetrics and Gynecology*  
B.A. 1956, Maryville College (Tennessee); M.D. 1960, University of Arkansas
- Myron Rose, *Assistant Clinical Professor of Gynecology*  
B.A. 1958, City University of New York, Brooklyn College; M.S. 1960, Northwestern University; M.D. 1967, University of Missouri
- Leonard Asher Rosen, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1971, M.D. 1976, George Washington University



- Meyer Rosenbaum, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1942, M.D. 1944, Tulane University
- Michael A. Ross, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1971, Dickinson College; M.D. 1975, George Washington University
- Barry Stephen Rothman, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1971, M.D. 1975, George Washington University
- Irwin Winn Rovner, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1948, M.D. 1953, University of Iowa
- Josiah Sacks, *Clinical Professor of Obstetrics and Gynecology*  
B.S. 1951, Providence College; M.D. 1955, Tufts University
- Julian Edwin Safran, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.A. 1972, M.D. 1975, George Washington University
- Melvin Wesley Sandmeyer, Jr., *Clinical Professor of Obstetrics and Gynecology*  
B.A. 1950, M.D. 1953, George Washington University
- Cesare Federico Santangelo, *Clinical Instructor in Obstetrics and Gynecology*  
B.A. 1978, Columbia University; M.D. 1982, George Washington University
- Thomas Edward Schmitt, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1968, University of Dayton; M.D. 1972, Ohio State University
- Charles Isaac Schneiderman, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1964, University of Michigan; M.D. 1968, George Washington University
- Anthony Robert Scialli, *Associate Clinical Professor of Obstetrics and Gynecology*  
B.S. 1975, Rensselaer Polytechnic Institute; M.D. 1975, Union University
- Thomas Walter Scott, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1969, M.D. 1975, George Washington University
- John Louis Sever, *Professor of Pediatrics, of Obstetrics and Gynecology, and of Microbiology*  
M.D. 1957, Ph.D. 1957, Northwestern University
- Joseph Bart Sheffery, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1937, Georgetown University
- James Glover Sites, *Professor of Obstetrics and Gynecology*  
M.D. 1947, George Washington University
- John Chauncey Skilling, *Assistant Clinical Professor of Obstetrics and Gynecology*  
A.B. 1955, Princeton University; M.D. 1961, Hahnemann Medical College
- Howard Neil Smith, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.S. 1967, Saint Peter's College; M.D. 1971, George Washington University
- Moises N. Steren, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1953, M.D. 1959, Litoral University, Argentina
- Steele Fuller Stewart, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*  
A.B. 1950, Carleton College; M.D. 1959, University of Pennsylvania
- Robert Joseph Stillman, *Associate Professor of Obstetrics and Gynecology*  
B.A. 1969, Boston University; M.D. 1973, Georgetown University
- Nelson Monroe Tart, *Clinical Professor of Obstetrics and Gynecology*  
B.S. 1949, Wake Forest University; M.D. 1955, George Washington University
- George Francis Tidey, *Instructor in Obstetrics and Gynecology*  
B.A. 1980, University of Virginia; M.D. 1984, Medical College of Virginia of Virginia Commonwealth University
- Elijah White Titus, Jr., *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1952, George Washington University
- Howard Pettit Treichler, *Clinical Professor of Obstetrics and Gynecology*  
M.D. 1946, George Washington University
- Marc Vatin, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1963, Lycee Charles de Gaulle, France; M.D. 1971, University of Marseille, France; M.P.H. 1979, University of North Carolina
- Chester Leroy Wagstaff, *Assistant Clinical Professor of Obstetrics and Gynecology*  
B.A. 1944, University of Richmond; M.D. 1951, University of Pennsylvania



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B.A. 1951, Oberlin College; M.D. 1955, New York Medical College

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A.B. 1948, Temple University; M.D. 1952, Hahnemann Medical College

## Ophthalmology

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B.A. 1943, M.D. 1945, University of Virginia

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B.A. 1947, M.D. 1952, American University of Beirut, Lebanon; M.S. 1957, University of Iowa

Michael Wellington Belin, *Assistant Professor of Ophthalmology and of Pediatrics*

M.D. 1978, Rutgers University

David Kip Berler, *Assistant Clinical Professor of Ophthalmology*

A.B. 1955, M.D. 1958, Cornell University

Blackwell Smith Bruner, *Clinical Instructor in Ophthalmology and in Pediatrics*

M.D. 1963, George Washington University

Jonca Camille Bull, *Assistant Clinical Professor of Ophthalmology*

A.B. 1974, Princeton University; M.D. 1978, Duke University

David Thornhill Casey, *Assistant Clinical Professor of Ophthalmology*

B.S. 1960, University of Pittsburgh; M.D. 1964, Hahnemann Medical College

Wiley Andrew Chambers II, *Adjunct Assistant Professor of Computer Medicine and of Ophthalmology*

B.A. 1980, Colgate University; M.D. 1983, George Washington University

Richard Martin Chavis, *Adjunct Assistant Professor of Ophthalmology*

B.A. 1965, M.S. 1967, Rutgers University; M.D. 1971, University of Missouri

Robert Day, *Assistant Clinical Professor of Ophthalmology*

A.B. 1936, Harvard University; M.D. 1943, Johns Hopkins University

Ronald Stuart Deitch, *Clinical Instructor in Ophthalmology*

A.B. 1954, Washington and Lee University; M.D. 1958, George Washington University

Paul Austin Dorn, Jr., *Clinical Instructor in Ophthalmology*

A.B. 1953, St. Anselm's College; M.D. 1965, Georgetown University

Anne Elizabeth Eager, *Assistant Clinical Professor of Ophthalmology*

M.D. 1967, Georgetown University

Bernard Ehrlich, *Clinical Instructor in Ophthalmology*

B.S. 1952, M.B., B.Surg. 1956, Durham University, England

Ben Sion Fine, *Associate Research Professor of Ophthalmology*

M.D. 1953, University of Toronto, Canada

Thomas Frey, *Assistant Clinical Professor of Ophthalmology and of Pediatrics*

B.A. 1955, M.D. 1958, Northwestern University

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B.A. 1965, University of Pennsylvania; M.D. 1969, George Washington University

David Stern Friendly, *Professor of Ophthalmology and of Pediatrics*

B.A. 1954, Carleton College; M.D. 1958, Columbia University

Maurice Leonard Gaspar, *Clinical Instructor in Ophthalmology*

B.A. 1974, City University of New York, Brooklyn College; M.D. 1977, Yeshiva University



- Paul Theodore Gavaris, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1961, Rutgers University; M.D. 1968, George Washington University
- Craig Erwin Geist, *Assistant Clinical Professor of Ophthalmology*  
B.A. 1975, College of Wooster; M.S. 1983, George Washington University; M.D. 1983, Medical College of Virginia of Virginia Commonwealth University
- William Steven Gilbert, *Associate Clinical Professor of Ophthalmology*  
A.B. 1957, Cornell University; M.D. 1961, Yeshiva University
- William Bainbridge Glew, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1950, Yale University; M.D. 1953, George Washington University; M.D. 1957, University of Minnesota
- Herbert Bennett Gould, *Assistant Clinical Professor of Ophthalmology and of Pediatrics*  
B.S. 1967, City University of New York, Brooklyn College; M.D. 1971, New York University
- Douglas Fielder Greer, *Adjunct Assistant Professor of Ophthalmology*  
B.A. 1961, Princeton University; M.D. 1966, Columbia University
- William Henry Hall, *Clinical Instructor in Ophthalmology*  
B.S. 1971, Howard University; M.D. 1975, State University of New York at Buffalo
- Sadeer Basim Hannush, *Clinical Instructor in Ophthalmology*  
B.S. 1978, University of Michigan; M.D. 1982, Wayne State University
- Richard Huberman, *Clinical Instructor in Ophthalmology*  
B.S. 1959, City University of New York, City College; M.D. 1963, University of Health Sciences/Chicago Medical School
- William Siti Nagib Ibrahim, *Assistant Clinical Professor of Ophthalmology*  
M.B., B.Ch. 1958, Alexandria University, Egypt
- Mohamad Sami Jaafar, *Assistant Professor of Ophthalmology and of Pediatrics*  
B.S. 1974, M.D. 1978, American University of Beirut, Lebanon
- Thomas Patrick Keenan, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1963, Manhattan College; M.D. 1967, Georgetown University
- Lawrence Marion King, Jr., *Associate Clinical Professor of Ophthalmology*  
B.S. 1948, Louisiana Tech University; M.D. 1953, Louisiana State University in New Orleans
- Malvin Donald Krinn, *Assistant Clinical Professor of Ophthalmology*  
M.D. 1965, University of Illinois
- David Lloyd Lanter, *Clinical Instructor in Ophthalmology*  
B.S. 1959, City University of New York, Queens College; M.D. 1963, New York Medical College
- Francis Gerald La Piana, *Adjunct Professor of Ophthalmology*  
M.D. 1962, George Washington University
- Jacqueline Anne Leavitt, *Assistant Professor of Ophthalmology*  
B.A. 1974, Mount Holyoke College; M.D. 1978, Wayne State University
- George Liss, *Clinical Instructor in Ophthalmology*  
B.A. 1955, M.D. 1958, George Washington University; M.S. 1964, Marquette University
- John Hayes Lodge, *Assistant Clinical Professor of Ophthalmology*  
A.B. 1947, West Virginia University; M.D. 1951, Johns Hopkins University
- Neil F. Martin, *Clinical Instructor in Ophthalmology*  
A.B. 1972, Harvard University; M.D. 1976, Johns Hopkins University
- Diane Florence McKenzie, *Clinical Instructor in Ophthalmology*  
B.S. 1978, State University of New York at Stony Brook; M.D. 1982, University of Pennsylvania
- Stephen Stavros Pappas, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1952, M.D. 1956, George Washington University
- Edward Samuel Parelhoff, *Assistant Clinical Professor of Ophthalmology and of Pediatrics*  
B.A. 1975, M.D. 1978, Johns Hopkins University
- Marshall Miller Parks, *Clinical Professor of Ophthalmology and of Pediatrics*  
A.B. 1939, Illinois College; M.D. 1943, St. Louis University
- Kevin Ira Perman, *Assistant Clinical Professor of Ophthalmology*  
M.D. 1979, George Washington University
- Arthur Raymond Pilkerton, Jr., *Assistant Clinical Professor of Ophthalmology*  
B.S. 1956, M.D. 1960, Georgetown University



- Harold Irvin Rodman, *Clinical Instructor in Ophthalmology*  
BA 1952, Johns Hopkins University; M.D. 1956, University of Maryland
- Nancy Josette Ronsheim, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1964, M.D. 1971, Cornell University; M.A.T. 1965, Harvard University
- Don Elliot Schwartz, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1963, City University of New York, Queens College; M.D. 1967, Yeshiva University
- Joseph Snyder, *Assistant Clinical Professor of Ophthalmology*  
AB 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University
- Henry Joseph Starr, *Clinical Instructor in Ophthalmology*  
BA 1955, Bowdoin College; M.D. 1959, Johns Hopkins University
- Robert Frederic Stephens, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1967, University of Oklahoma; M.D. 1971, Washington University
- Samuel Stoleru, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1961, Colegio Hebreo Jorge Isaacs, Colombia; M.D. 1968, Universidad del Valle, Colombia
- Roberto Novarro Sunga, *Assistant Clinical Professor of Ophthalmology*  
M.D. 1958, University of the Philippines
- Evadne Marjorie Titer, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1963, M.D. 1967, Howard University
- Manfred A. Von Fricken, *Assistant Clinical Professor of Ophthalmology*  
AB 1971, M.M.S. 1973, Rutgers University; M.D. 1975, Washington University
- David Murray Wanicur, *Assistant Clinical Professor of Ophthalmology*  
BA 1961, University of Pennsylvania; M.D. 1965, University of Pittsburgh
- Paul Vernon Whitmore, *Associate Professor of Ophthalmology*  
B.S. 1962, M.D. 1966, University of Michigan
- Henry Sindos Wicker, *Assistant Clinical Professor of Ophthalmology*  
B.S. 1948, Xavier University; M.D. 1953, Howard University
- John Sam Zacharia, *Associate Professor of Ophthalmology*  
B.S. 1964, M.D. 1968, American University of Beirut, Lebanon
- Kenneth Howard Zaslow, *Adjunct Assistant Professor of Ophthalmology*  
BA 1961, City University of New York, Brooklyn College; M.D. 1973, Union University
- Ernest Michael Zimmerman, *Assistant Clinical Professor of Ophthalmology*  
M.D. 1963, University of Toronto, Canada
- Mervin Harvey Zimmerman, *Assistant Clinical Professor of Ophthalmology*  
M.D. 1959, University of Toronto

## Orthopaedic Surgery

- Jeffrey Allen Abend, *Assistant Clinical Professor of Orthopaedic Surgery*  
AB 1970, Case Western Reserve University; M.D. 1974, State University of New York Upstate Medical Center
- R. Marshall Ackerman, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.S. 1958, M.D. 1962, University of Pittsburgh
- Brent Roger Ain, *Associate Clinical Professor of Orthopaedic Surgery*  
AB 1967, University of Rochester; M.D. 1972, Tulane University
- Hereward Seagrieve Cattell, *Adjunct Associate Professor of Orthopaedic Surgery*  
BA 1954, Amherst College; M.D. 1958, University of Rochester
- John Broner Cohen, *Clinical Instructor in Orthopaedic Surgery*  
BA 1982, University of Pennsylvania; M.D. 1978, George Washington University
- Andrew Ivo Dobranski, *Assistant Clinical Professor of Orthopaedic Surgery*  
(Anatomy)  
M.D. 1954, Medical Academy of Warsaw, Poland
- Robert Leroy Dow, *Associate Clinical Professor of Orthopaedic Surgery*  
AB 1944, M.D. 1948, Cornell University
- Thomas Bernard Fleeter, *Clinical Instructor in Orthopaedic Surgery*  
BA 1973, M.B.A. 1975, Northwestern University; M.D. 1979, Howard University



- Ulla M-Son Fortune, *Associate Clinical Professor of Orthopaedic Surgery*  
M.D. 1965, George Washington University
- William Patrick Fortune, *Professor of Orthopaedic Surgery and of Medicine*  
B.S. 1953, Springfield College; M.D. 1965, George Washington University
- Melinda Miller Gardner, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.A. 1965, Duke University; M.D. 1974, George Washington University
- Harold Bruce Glickman, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.A. 1967, Emory University; D.P.M. 1971, Pennsylvania College of Podiatric Medicine
- James Henry Graeter, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.S. 1970, M.D. 1974, Georgetown University
- Richard Mark Grossman, *Clinical Instructor in Orthopaedic Surgery*  
B.A. 1976, Emory University; M.D. 1980, Georgetown University
- Stephen Flack Gunther, *Professor of Orthopaedic Surgery*  
B.A. 1963, Yale University; M.D. 1967, Union University
- Stephen Samuel Haas, *Associate Clinical Professor of Orthopaedic Surgery*  
M.D. 1965, University of Oklahoma
- Jack Wayne Harvey, *Clinical Instructor in Orthopaedic Surgery*  
B.S. 1959, M.D. 1963, George Washington University
- Robert John Heilen, *Clinical Instructor in Orthopaedic Surgery*  
B.Ch.E. 1957, The Cooper Union; M.D. 1964, New York University
- Robert Mark Hochman, *Clinical Instructor in Health Care Sciences and in Orthopaedic Surgery*  
B.A. 1968, City University of New York, City College; D.P.M. 1978, Pennsylvania College of Podiatric Medicine
- David Charles Johnson, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.S. 1969, M.D. 1973, Yale University
- Stephen Jeremy Kominsky, *Clinical Instructor in Orthopaedic Surgery*  
B.S. 1974, University of Maryland; D.P.M. 1982, Pennsylvania College of Podiatric Medicine
- Evangelos Nicholas Koulizakis, *Clinical Instructor in Orthopaedic Surgery*  
M.D. 1956, University of Athens, Greece
- Panagiotis A. Labropoulos, *Assistant Professor of Orthopaedic Surgery*  
M.D. 1971, University of Athens, Greece
- Herbert Edward Lane, Jr., *Associate Clinical Professor of Orthopaedic Surgery*  
M.D. 1947, Georgetown University
- Stanford A. Lavine, *Assistant Clinical Professor of Orthopaedic Surgery*  
B.A. 1950, M.D. 1954, University of Maryland
- Louis Edward Levitt, *Clinical Instructor in Orthopaedic Surgery*  
B.A. 1970, University of Virginia; M.Ed. 1972, Boston University; M.D. 1978, Medical College of Virginia of Virginia Commonwealth University
- Randall Jeffrey Lewis, *Associate Clinical Professor of Orthopaedic Surgery*  
B.A. 1965, Yale University; M.D. 1969, Harvard University
- Carl Charles MacCartee, Jr., *Assistant Clinical Professor of Orthopaedic Surgery*  
B.A. 1963, Duke University; M.D. 1967, Georgetown University
- Martin Miles Malawer, *Associate Professor of Orthopaedic Surgery and of Pediatrics*  
A.B. 1955, State University of New York at Buffalo; M.D. 1969, New York University
- Norman Aaron Marcus, *Clinical Instructor in Orthopaedic Surgery*  
B.A. 1974, Johns Hopkins University; M.D. 1978, Stanford University
- Kathleen Ann McHale, *Clinical Instructor in Orthopaedic Surgery*  
B.S. 1971, Villanova University; M.D. 1975, Medical College of Pennsylvania
- Peter Alan Moskovitz, *Associate Clinical Professor of Orthopaedic Surgery*  
B.A. 1954, Haverford College; M.D. 1969, Columbia University
- Stephen Sanborn Nason, *Associate Professor of Orthopaedic Surgery and of Pediatrics*  
M.D. 1967, Tulane University



- Robert Jon Neviaser, *Professor of Orthopaedic Surgery*  
 AB. 1958, Princeton University; M.D. 1962, Thomas Jefferson University
- Thomas Jay Neviaser, *Associate Clinical Professor of Orthopaedic Surgery*  
 BA. 1962, University of Pennsylvania; M.D. 1966, George Washington University
- Ronald Ottenberg, *Clinical Instructor in Orthopaedic Surgery*  
 BA. 1956, M.D. 1959, George Washington University
- Diane Brickley Parsons, *Associate Research Professor of Orthopaedic Surgery*  
 AB. 1967, Newton College; Ph.D. 1972, Boston University
- Stephen W. Pournaras, Jr., *Assistant Clinical Professor of Orthopaedic Surgery*  
 BA. 1975, M.D. 1980, University of Virginia
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 BA. 1969, M.D. 1979, George Washington University
- Stanley Roy Rothschild, *Assistant Clinical Professor of Orthopaedic Surgery*  
 B.S. 1964, City University of New York, Queens College; M.D. 1968, State University of New York Upstate Medical Center
- William James Sadlack, *Adjunct Instructor in Orthopaedic Surgery*  
 B.S. 1964, Saint Peter's College; M.D. 1971, St. Louis University
- Bahman Sadr, *Assistant Professor of Orthopaedic Surgery*  
 BA. 1967, M.A., M.B., B.Chir. 1970, Cambridge University; F.R.C.S.Eng. 1974, F.R.C.S.(Orth) 1981, Royal College of Surgeons, England
- Jerome Shapiro, *Assistant Clinical Professor of Orthopaedic Surgery*  
 BA. 1953, City University of New York, Brooklyn College; D.P.M. 1957, New York College of Podiatric Medicine
- Stephen Louis Shapiro, *Clinical Instructor in Orthopaedic Surgery*  
 B.S. 1972, Yale University; M.D. 1976, George Washington University
- Michael David Thomas, *Assistant Professor of Orthopaedic Surgery and of Pediatrics*  
 B.S. 1976, Texas A&M University; M.S. 1978, Prairie View A&M University; M.D. 1981, Howard University
- Laura Lowe Tosi, *Assistant Professor of Orthopaedic Surgery and of Pediatrics*  
 BA. 1971, Boston University; M.D. 1977, Harvard University
- Anthony Steven Unger, *Clinical Instructor in Orthopaedic Surgery*  
 James Christos Vailas, *Assistant Professor of Orthopaedic Surgery*  
 BA. 1978, M.D. 1981, Dartmouth College
- Brantley Paul Vitek, *Associate Clinical Professor of Orthopaedic Surgery*  
 BA. 1957, Western Maryland College; M.D. 1961, University of Maryland
- Kenneth Gerard Ward, *Clinical Instructor in Orthopaedic Surgery*  
 BA. 1969, Northwestern University; M.D. 1973, University of Medicine and Dentistry of New Jersey
- Sam W. Wiesel, *Professor of Orthopaedic Surgery*  
 BA. 1967, Emory University; M.D. 1971, University of Pennsylvania
- Jeffrey Francis Witte, *Assistant Clinical Professor of Orthopaedic Surgery*  
 AB. 1963, Georgetown University; M.D. 1967, University of Michigan
- William B. Wolf III, *Clinical Instructor in Orthopaedic Surgery*  
 BA. 1979, Princeton University; M.D. 1982, George Washington University

## Pathology

- Andreas Andrew Abraham, *Associate Professor of Pathology*  
 M.D. 1953, University of Szeged, Hungary
- Yusef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*  
 B.S. 1945, University of Baghdad, Iraq; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University
- Tatiana T. Antonovych, *Professional Lecturer in Pathology*  
 M.D. 1941, University of Vienna, Austria
- Gary Eben Ballmann, *Lecturer in Pathology*  
 BA. 1970, University of Missouri; M.S. 1974, Texas Christian University; Ph.D. 1986, University of Maryland
- Christine Lillian Barrett, *Lecturer in Pathology*  
 B.S. 1986, Medical College of Virginia of Virginia Commonwealth University
- Kristina Marie Bingham, *Special Lecturer in Pathology*



- Margaret Stanley Boone, *Adjunct Associate Professor of Pathology*  
B.A. 1968, George Washington University; M.Ed. 1970, University of Florida; M.A. 1975, Ph.D. 1977, Ohio State University
- Gloria Godbey Brennan, *Associate Clinical Professor of Pathology*  
B.A. 1949, M.D. 1952, George Washington University
- Ralph Milford Bunte, *Adjunct Assistant Professor of Pathology*  
B.S. 1965, D.V.M. 1967, University of Illinois
- Nicolas George Cacciabeve, *Assistant Clinical Professor of Pathology*  
B.S. 1975, Fairleigh Dickinson University; M.D. 1979, Georgetown University
- Jimmy Doyle Campbell, *Special Lecturer in Pathology*
- Joseph Michael Campos, *Associate Professor of Pediatrics and of Pathology*  
A.B. 1968, M.A. 1970, Ph.D. 1976, University of California, Berkeley
- Roma Sakhuja Chandra, *Professor of Pathology and of Pediatrics*  
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- Gary A. Clawson, *Associate Professor of Pathology (Anatomic Pathology)*  
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- Marion Lazar Usher, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
 BA 1962, McGill University, Canada; M.S. in S.W. 1965, University of Wisconsin
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 AB 1954, Miami University; M.S.W. 1956, Smith College
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B.S. 1964, City University of New York, Brooklyn College; M.A. 1966, Columbia University; Ph.D. 1970, University of Nebraska
- Jeremy Peter Waletzky, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
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- Frederick Steven Wamboldt, *Assistant Professor of Psychiatry and Behavioral Sciences*  
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- Wolfgang O. Weigert, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Pediatrics*  
B.A. 1955, Swarthmore College; M.D. 1959, Case Western Reserve University
- Daniel Roy Weinberger, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
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- Paul Stephen Weisberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
A.B. 1952, Harvard University; M.D. 1958, Marquette University
- Stephen M. Weissman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
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- James Lansing Wellhouse, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*  
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- Karen Cameron Wells, *Associate Professor of Psychiatry and Behavioral Sciences and of Pediatrics*  
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- Raymond B. Wertheim, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Pediatrics*  
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- Jerry M. Wiener, *Leon Yochelson Professor of Psychiatry and Behavioral Sciences and Professor of Pediatrics*  
M.D. 1956, Baylor University
- Norman Louis Wilson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*  
B.S. 1959, Yale University; M.D. 1963, Harvard University
- James Howard Wise, *Associate Professor of Pediatrics and of Psychiatry and Behavioral Sciences*  
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- Ralph Emil Wittenberg, *Clinical Professor of Psychiatry and Behavioral Sciences*  
B.A. 1956, M.D. 1960, Wayne State University
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B.A. 1928, University of California, Berkeley
- Steven Joel Wolin, *Clinical Professor of Psychiatry and Behavioral Sciences*  
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- Henry Harcus Work, *Clinical Professor of Psychiatry and Behavioral Sciences*  
A.B. 1933, Hamilton College; M.D. 1937, Harvard University



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- Anthony Zappala, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*  
 M.D. 1942, George Washington University
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 B.A. 1959, Dartmouth College; M.D. 1963, New York University
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- Lawrence C. Zinar, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*  
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 B.A. 1958, Amherst College; M.D. 1963, Harvard University
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 B.A. 1965, Harvard University; J.D. 1969, University of Chicago; M.D. 1975, Yale University

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- H. Richard Adams, *Assistant Research Professor of Radiology*  
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- Houtan Adib, *Assistant Professorial Lecturer in Radiology*  
 M.D. 1962, Tehran University
- Christian O. Alele, *Assistant Clinical Professor of Radiology*  
 M.B., B.S. 1955, University of London, England
- Craig Merrill Allen, *Special Lecturer in Radiology*
- Robert Mayer Allman, *Professor of Radiology*  
 B.S. 1953, Dickinson College; M.D. 1957, Thomas Jefferson University
- Jack William Andrews, *Special Lecturer in Radiology*
- Francis Bernard Atkins, *Adjunct Assistant Professor of Radiology*  
 B.S. 1968, Pratt Institute; M.S. 1971, Rutgers University; Ph.D. 1978, University of Chicago
- Gunter Josef Augustin, *Clinical Professor of Radiology*  
 M.D. 1952, University of Heidelberg
- Queen Ella Ayers, *Special Lecturer in Radiology*
- Helen Jeanne Barr, *Clinical Instructor in Radiology*  
 B.A. 1976, Lehigh University; M.D. 1982, George Washington University
- Peter William Blue, *Assistant Clinical Professor of Radiology*  
 B.A. 1964, Michigan State University; M.D. 1969, University of Chicago
- Conwell Edward Boccia, *Special Lecturer in Radiology*
- Frederick Thomas Borts, *Assistant Clinical Professor of Radiology*  
 B.A. 1971, Case Western Reserve University; M.D. 1975, Georgetown University
- Eileen Walkavich Bradley, *Research Professor of Radiology*  
 B.S. 1966, Anna Maria College; M.S. 1968, D.Sc. 1971, Harvard University
- Samson R. Brown, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*  
 B.A. 1958, Rutgers University; M.D. 1962, Hahnemann Medical College
- David Richard Buck, *Assistant Clinical Professor of Radiology*  
 B.S. 1970, Oklahoma State University; M.D. 1974, University of Texas Southwestern Medical School at Dallas
- Stephen Raymond Bunker, *Assistant Clinical Professor of Radiology*  
 B.A. 1971, University of California, Berkeley; M.D. 1976, Creighton University



- Priscilla Fay Butler, *Assistant Professor of Radiology*  
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- Kathleen Gordon Cantwell, *Associate Clinical Professor of Radiology*  
B.A. 1967, University of Texas; M.D. 1975, Howard University
- Steven Charles Carabell, *Associate Professor of Radiology (Radiation Oncology)*  
A.B. 1969, M.D. 1973, Harvard University
- Antoinette Castagnolo, *Adjunct Assistant Professor of Radiology*  
B.S. 1983, George Washington University
- Eugene David Cawley, *Special Lecturer in Radiology*
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B.S. 1958, Washington University; M.S. 1962, Stanford University; M.D. 1976, George Washington University
- Peter L. Choyke, *Assistant Professorial Lecturer in Radiology*  
B.S. 1976, Pennsylvania State University; M.D. 1979, Thomas Jefferson University
- Michael Louis Cianci, *Adjunct Assistant Professor of Radiology*  
B.S. 1968, University of Scranton
- Charles Michael Citrin, *Associate Clinical Professor of Radiology*  
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- Richard L. Cole, Jr., *Assistant Clinical Professor of Radiology*  
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- Sallie Ann Cook, *Special Lecturer in Radiology*
- David Jennings Curtis, *Professor of Radiology*  
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- Abraham Hillel Dachman, *Professorial Lecturer in Radiology*  
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- David Oliver Davis, *Professor of Radiology, of Neurology, and of Neurological Surgery*  
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- Joseph Diggs, *Assistant Clinical Professor of Radiology*  
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- Donald Arthur Downen, *Special Lecturer in Radiology*
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- Asaf Durakovic, *Associate Professorial Lecturer in Radiology*  
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- Alfonso A. Estepa, Jr., *Special Lecturer in Radiology*



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 M.D. 1963, Shiraz Medical School, Iran  
 Richard Dale Gillon, *Special Lecturer in Radiology*  
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 B.S. 1967, Pennsylvania State University; M.D. 1969, Thomas Jefferson University  
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 John Mack Hatch, *Special Lecturer in Radiology*  
 B.S. 1975, B.S. 1976, University of Texas at El Paso  
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 M.B., B.Ch. 1970, University College, Dublin  
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 Eugene Robert Jacobs, *Associate Professor of Radiology*  
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 Edmund Ernest Jamieson, *Special Lecturer in Radiology*  
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 Barry Theodore Katzen, *Clinical Professor of Radiology*  
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 B.S.T. 1971, Saint Louis University; M.S. 1972, University of Cincinnati  
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B.S. 1949, Duquesne University
- Richard Lynn LaFontaine, *Special Lecturer in Radiology*  
B.S. 1974, Saint Martin's College; M.S. 1976, University of Washington; M.S. 1979, University of Northern Colorado; Ph.D. 1983, University of California, Los Angeles
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M.D. 1965, Catholic Medical College, Korea
- Tommy Earl Lewis, *Adjunct Instructor in Radiology*
- Edward Robert Lipsit, *Assistant Clinical Professor of Radiology*  
B.A. 1971, Yeshiva University; M.D. 1975, Georgetown University
- Robert Eugene Long, *Special Lecturer in Radiology*  
B.S. 1980, Connecticut Board for Academic Award
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- Charles P. Lynch, *Special Lecturer in Radiology*
- Charles Philip Magal, *Clinical Instructor in Radiology*  
B.S. 1975, Goshen College; M.S. 1977, M.D. 1982, George Washington University
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- Michael Lee Meserve, *Adjunct Assistant Professor of Radiology*
- Guy Anthony Messer, *Special Lecturer in Radiology*
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BS 1970, Carroll College; M.D. 1974, Yale University
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BS 1971, St. Lawrence University; M.D. 1975, George Washington University
- Edward Julian Nutick, *Special Lecturer in Radiology*  
William Wells Olmsted, *Professor of Radiology*  
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- Behram Pastakia, *Associate Clinical Professor of Radiology*  
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BS in BA 1965, Clark University; M.B.A. 1976, Suffolk University
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- Robert Sheridan Pyatt, Jr., *Associate Clinical Professor of Radiology*  
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- Jay A. Rachlin, *Assistant Professorial Lecturer in Radiology*  
BS 1971, M.S. 1972, University of Miami
- Samuel Binondo Ramos, *Special Lecturer in Radiology*  
BS 1983, La Verne University
- Richard Charney Reba, *Professor of Radiology (Nuclear Medicine) and of Medicine*  
MD 1957, University of Maryland
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BA 1976, Gustavus Adolphus College; M.D. 1982, University of Minnesota
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- Robert Joseph Richmond, *Special Lecturer in Radiology*
- Terry Randall Riddle, *Special Lecturer in Radiology*
- Michael Bruce Robins, *Clinical Instructor in Radiology*  
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- Bruce Robert Rock, *Adjunct Instructor in Radiology*
- S. David Rockoff, *Professor of Radiology*  
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- Charles Clanton Rogers, *Professor of Radiology (Radiation Therapy) and of Obstetrics and Gynecology*  
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- Bruce Edward Rubin, *Associate Clinical Professor of Radiology*  
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- Howard Alan Sachs, *Assistant Professorial Lecturer in Radiology*  
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- Lera B. Sachs, *Assistant Clinical Professor of Radiology*  
BA 1972, Barnard College; M.D. 1976, Yeshiva University
- Philip Matthew Sanchez, *Special Lecturer in Radiology*  
BS 1967, National University
- William Desmond Keith Sargeant, *Special Lecturer in Radiology*
- Joseph Schwab, *Assistant Professor of Radiology*  
BA 1976, University of Pennsylvania; M.D. 1981, Pennsylvania State University



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B.S. 1972, North Dakota State University; M.D. 1976, Tufts University
- Eugene David Silverman, *Assistant Clinical Professor of Radiology*  
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M.B., B.S. 1971, Delhi University, India
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- James Joseph Smith, *Clinical Professor of Radiology*  
B.A. 1932, Catholic University of America; M.D. 1940, Yale University
- Gary Scott Staples, *Assistant Clinical Professor of Radiology*  
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- Raymond Eugene Strawn, Jr., *Adjunct Instructor in Radiology*  
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B.S. 1974, M.D. 1978, George Washington University
- Marcia Annette Templeton, *Special Lecturer in Radiology*  
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- Jeffrey Scott Thorkelsen, *Special Lecturer in Radiology*
- Andrew Leon Tievsky, *Assistant Clinical Professor of Radiology (Neuroradiology)*  
B.A. 1970, University of Rochester; M.D. 1974, George Washington University
- Glenn Lorin Tonnesen, *Assistant Clinical Professor of Radiology*  
B.S. 1969, Brown University; M.D. 1973, University of Utah
- Kenneth Lee Turman, *Special Lecturer in Radiology*
- Gottlieb Lindenmayer Turnbull, *Assistant Clinical Professor of Radiology*  
B.A. 1955, Dillard University; M.D. 1960, Howard University
- Arina Van Breda, *Associate Clinical Professor of Radiology (Diagnostic Radiology)*  
A.B. 1974, M.D. 1976, Boston University
- Vijay Mohan Varma, *Professor of Radiology*  
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B.S. 1968, M.D. 1972, University of Puerto Rico
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- Kaethe Wechsler-Jentzsch, *Assistant Professor of Radiology*  
M.D. 1964, Freie University, Germany
- William Dean Wehunt, *Assistant Clinical Professor of Radiology*  
B.S. 1968, Mercer University; M.D. 1972, Vanderbilt University
- Frederick Leo Weiland, *Assistant Clinical Professor of Radiology*  
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- Lowell B. Weiner, *Assistant Professorial Lecturer in Radiology*  
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- Michael Aron Weiss, *Associate Clinical Professor of Radiology*  
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- Barry Ward Wessels, *Associate Professor of Radiology (Radiation Oncology)*  
B.S. 1969, Rensselaer Polytechnic Institute; Ph.D. 1975, University of Notre Dame
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B.S. 1967, College of William and Mary; M.D. 1971, University of Virginia
- Charles Lavern Williams, *Special Lecturer in Radiology*
- Edward Leon Woods, *Special Lecturer in Radiology*



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- Ellen Davis Yorke, *Associate Professor of Radiology*  
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- Kirk Andrew Young, *Special Lecturer in Radiology*
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 B.S. 1972, M.D. 1976, Northwestern University

## Surgery

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- Mark Vincent Alexander, *Clinical Instructor in Surgery (Otolaryngology) and in Pediatrics*  
 B.S. 1970, Hillsdale College; M.D. 1973, Howard University
- Katherine Louise Alley, *Assistant Clinical Professor of Surgery*  
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- Ralph Walter Alman, Jr., *Clinical Instructor in Surgery (Oral Surgery)*  
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 B.S. 1961, University of Maryland; D.D.S. 1965, Georgetown University
- William Louis Amoroso, Jr., *Special Lecturer in Surgery*  
 M.D. 1945, George Washington University
- Kathryn Duncan Anderson, *Professor of Surgery and of Pediatrics*  
 B.A. 1961, M.A. 1964, Cambridge University; M.D. 1964, Harvard University
- Michael Richard Antopol, *Assistant Clinical Professor of Surgery*  
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- Nicholas Michael Azzato, *Clinical Instructor in Surgery*  
 B.S. 1945, M.D. 1947, University of Chicago
- Norman Lee Barr, Jr., *Clinical Professor of Surgery (Otolaryngology)*  
 B.A. 1959, Princeton University; M.D. 1965, Georgetown University
- Barbara Lee Bass, *Assistant Professor of Surgery*  
 B.S. 1975, Tufts University; M.D. 1979, University of Virginia
- Bradley Holmes Bennett, *Clinical Instructor in Surgery*  
 B.S. 1973, Tufts University; M.D. 1977, Georgetown University
- Willie Clifton Blair, *Assistant Clinical Professor of Surgery*  
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 A.B. 1949, Brown University; M.D. 1954, George Washington University
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- William R. Bond, Jr., *Assistant Clinical Professor of Surgery (Otolaryngology) and of Pediatrics*  
 B.S. 1969, Upsala College; M.D. 1973, St. Louis University
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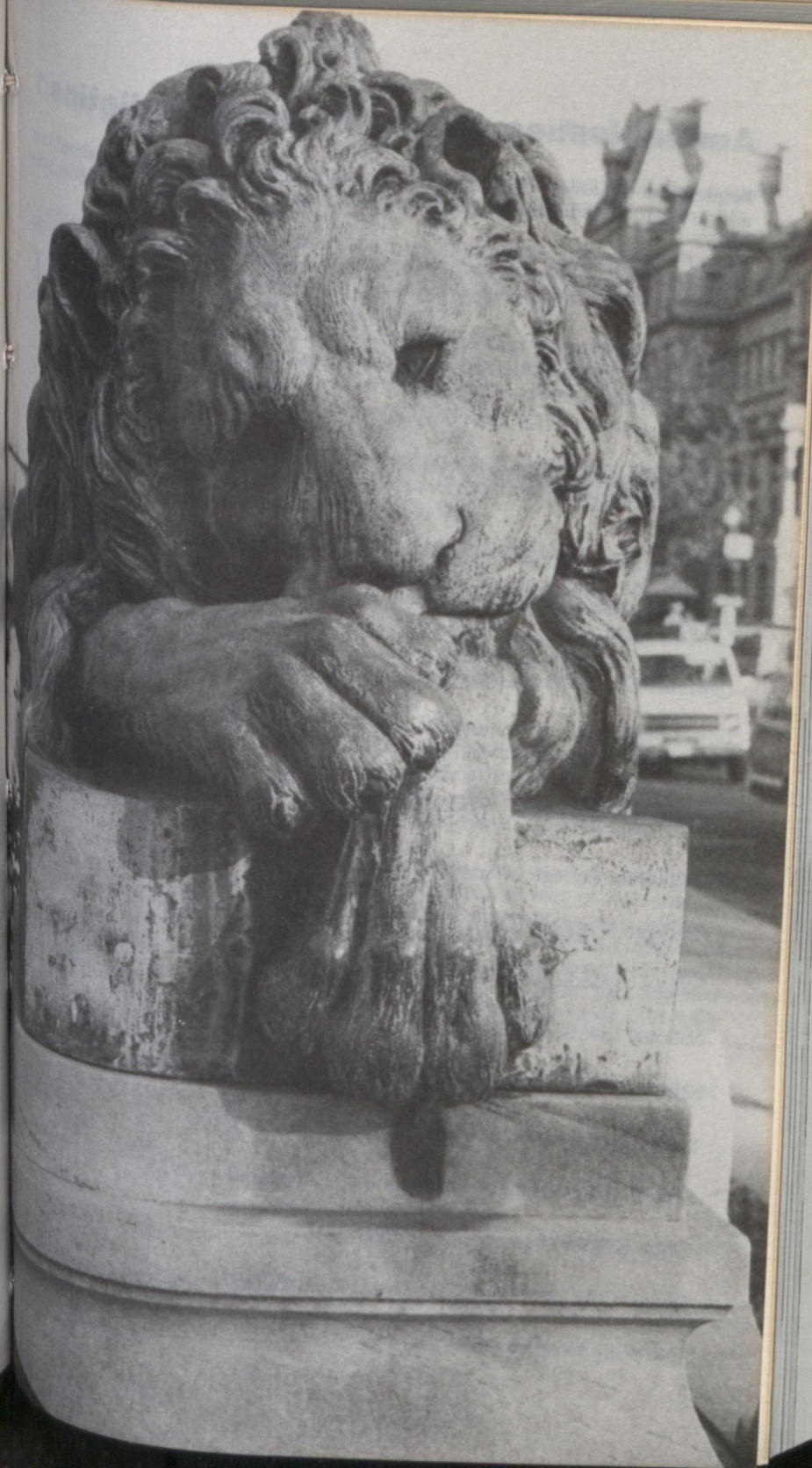
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## **Annual Issues of the University Bulletins**

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052.

*Undergraduate and Graduate Programs* (covering all schools and divisions exclusive of the three listed below), Admissions Office

*School of Engineering and Applied Science*, Admissions and Registration Office,  
School of Engineering and Applied Science

*National Law Center*, Admissions Office, National Law Center

*School of Medicine and Health Sciences*, Admissions Office, School of Medicine and  
Health Sciences

*Schedule of Classes* (On Campus), Fall, Spring, and Summer, Registrar

*Schedule of Classes* (Off Campus), Fall, Spring, and Summer, Division of Continuing  
Education

*Summer Sessions Announcement*, Summer Sessions Office

## **The George Washington University**

Columbian College of Arts and Sciences, 1821

Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

School of Education and Human Development, 1907

School of Government and Business Administration, 1928

Elliott School of International Affairs, 1928

Division of Continuing Education, 1916/1930/1981

University Hospital, 1898



## Colleges and Schools—Degree Programs

**Columbian College of Arts and Sciences:** Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

**Graduate School of Arts and Sciences:** Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

**School of Medicine and Health Sciences:** Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

**National Law Center:** Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

**School of Engineering and Applied Science:** Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Computer Science) (B.S. [C.S.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Bachelor of Science (Systems Analysis and Engineering) (B.S. [S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

**School of Education and Human Development:** Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

**School of Government and Business Administration:** Bachelor of Accountancy (B.Acc.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acc.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), and Doctor of Philosophy (Ph.D.)

**Elliott School of International Affairs:** Bachelor of Arts (B.A.) and Master of Arts (M.A.)



The  
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WASHINGTON DC

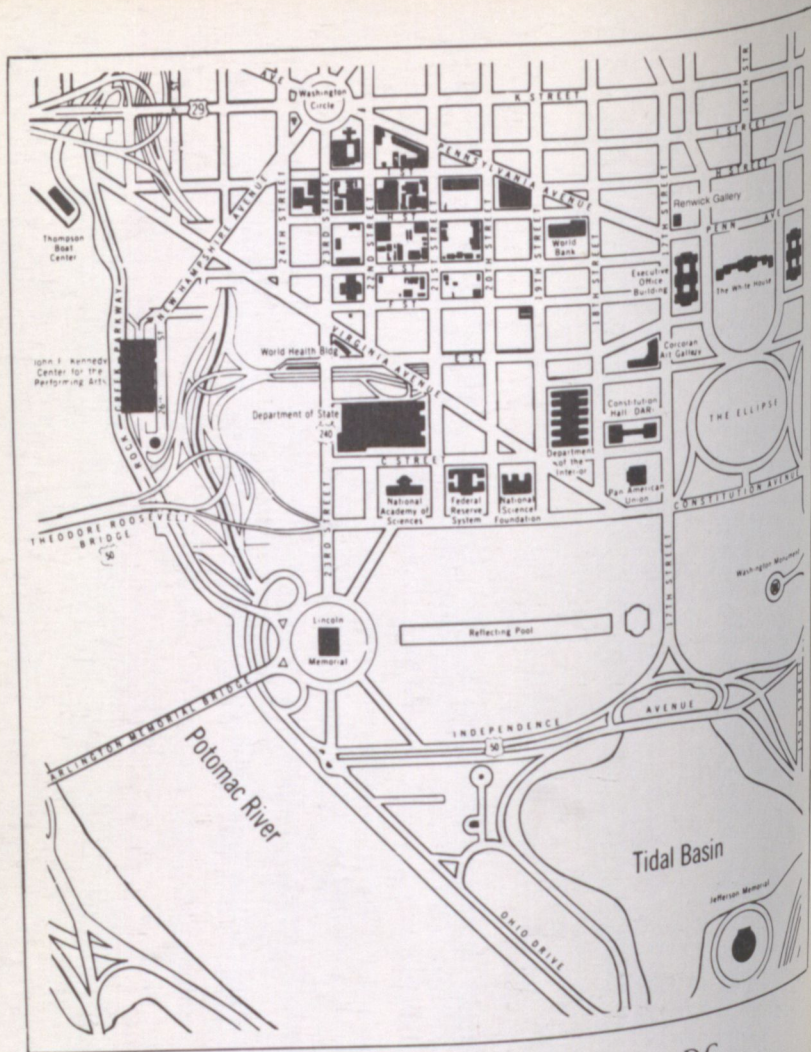


The George  
Washington  
University

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National Law Center  
Bulletin 1989-1990





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National Law Center Bulletin  
August 1989

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**National Law Center Bulletin  
1989-1990**

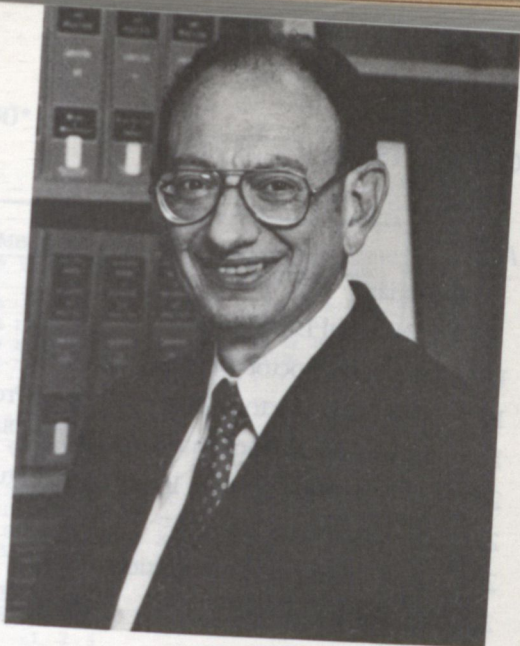
**Washington, D.C. 20052**





THE GEORGE WASHINGTON UNIVERSITY  
NATIONAL LAW CENTER





# TO PROSPECTIVE STUDENTS

This Bulletin is designed to provide you with general information concerning the George Washington University National Law Center, including registration, fees, and financial aid, as well as a list of faculty members and courses of instruction. It is difficult in such a book of "facts" to capture the spirit and tradition of friendliness and cooperation among students, faculty, and staff that characterizes the law school and provides a superb environment for study.

If you join us as a first-year student, you will soon discover that the first year of the school is an intense one. You will be assigned to a section that will become a little community of its own, with a camaraderie and esprit de corps that will make that first year one of the most vivid of your life.

As an advanced J.D. or LL.M. student, your time here will be one of intellectual growth. In your upper-class years, you may choose to take one of the many courses and programs in fields, such as Administrative Law, Labor Law and Antitrust Law, Land Contracts, International Law, Constitutional Rights, Government Development, Law, Patent Law, or Taxation, which have given this school its reputation as a center for study and research in public law. Graduate students may choose to specialize in one of these areas just mentioned. As a J.D. student in your upper-class years, you might also choose to direct your energies to the school's varied and intense programs in Clinical Law.

Our physical environment strongly complements our academic program. Just a few years ago, we completed a major expansion and renovation that has produced a handsome, well-integrated building designed to encompass all necessary aspects of law school activity.

It should be evident that the National Law Center is a large, dynamic place, with a strong sense of community, in which the study of law is both enjoyable and stimulating.

Cordially,

*Jack H. Friedenthal*

Jack H. Friedenthal  
Dean



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# THE CALENDAR 1989-1990\*

## AUGUST 1989

S	M	T	W	T	F	S
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## APRIL 1990

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## JANUARY 1990

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## OCTOBER 1989

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## JULY 1990

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## 1989 FALL SEMESTER

- August 17-18 Registration *Thursday* (12:30-7 p.m.) and *Friday* (2-6 p.m.)
- August 21 Classes begin *Monday*
- September 4 Labor Day (holiday) *Monday*
- October 1 Application for February graduation due
- October 6 S.J.D. dissertations of February candidates due
- November 23-24 *Friday*
- December 1 Thanksgiving holiday *Thursday-Friday*
- December 1 Last day of fall-semester classes *Friday*
- December 2-15 LL.M. theses of February candidates due
- Reading and examination period

\*The Academic Calendar is subject to change.



## 1990 SPRING SEMESTER

- January 4-5* Registration *Thursday* (12:30-7 p.m.) and *Friday* (10 a.m.-2 p.m.)  
*January 8* Classes begin *Monday*  
*January 15* Martin Luther King Day (holiday) *Monday*  
*January 19* S.J.D. dissertations of May candidates due *Friday*  
*February 1* Application for May graduation due  
*February 18* Winter Convocation *Sunday*  
*February 19* George Washington's birthday observed (holiday) *Monday*  
*March 9* Spring recess begins after last class *Friday*  
*March 19* Classes resume *Monday*  
*April 26* LL.M. theses of May candidates due *Thursday*  
Last day of spring-semester classes *Thursday*  
*April 27-May 10* Reading and examination period  
*May 20* Commencement *Sunday*





## THE NATIONAL LAW CENTER

### HISTORY

The Law Center, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty that reflected the fact that it was at the seat of our nation's government. Supreme Court Justices David J. Brewer and John Marshall Harlan were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American practice) in 1951.

In 1954, the National University School of Law, which had held an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental and Energy Law; Patent Law; International and Comparative Law; and Government Contracts. The academic courses reflect the breadth in public law for which the Law Center is well known.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed that is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the Community Legal Clinic, Clinical Studies in Environmental Law, Students in Court, and individual projects supervised by the Law Students Civil Rights Research Council. Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation, and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

### UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University.



including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Susan B. Kaplan, Special Assistant to the President, George Washington University, Washington, D.C. 20052, (202)994-6500, or to the Assistant Secretary for Civil Rights of the U.S. Department of Education.

#### LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in a central area of the nation's capital, the focal point of the law in action, both American and international. The work of the Center goes on in this environment, presenting a unique opportunity for observation and study of federal agencies—judicial, legislative, and administrative. Readily accessible are the Supreme Court of the United States, the federal trial and appellate courts of the District of Columbia, and federal courts of special jurisdiction, such as the United States Court of Appeals for the Federal Circuit, the United States Tax Court, and the Court of Military Appeals. Current federal legislation can be studied as it is considered by Congressional committees and as it comes up for debate on the floors of the House of Representatives and the Senate. With respect to the federal administrative agencies, students here in Washington have matchless opportunities for study and observation. They can attend informal and formal hearings of these agencies and can obtain from the docket sections complete records of administrative adjudication in specific cases. Illustrative of such federal agencies are the Interstate Commerce Commission in the field of transportation; the Federal Trade Commission in the field of trade regulation; the Securities and Exchange Commission in the field of security issues and corporate finance; the National Labor Relations Board in the field of labor-management relations; the United States Patent Office in the field of patent law; the Federal Energy Regulatory Commission in the field of water, natural gas, and electric power; and the Federal Communications Commission in the field of radio and television.

Supplementing these environmental advantages of law in action are the exceptional research library collections in the Library of Congress, in the various departments of the federal government, and in the libraries of the headquarters of international and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use by research students in international and comparative law, fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

#### ENRICHMENT PROGRAM

The Law Center supplements and enriches its diverse law programs by bringing to the school eminent legal scholars, judges, distinguished members of the bar, members of Congress, and high-level government officials to offer lectures and informal seminars with students and faculty. Participants in the Enrichment Program have included columnist Anthony Lewis, Supreme Court Justices Lewis Powell, Antonin Scalia, Sandra Day O'Connor, and Harry Blackmun, CIA Director William Webster, Yale University President Benno Schmidt, Senator Bill Bradley,





U.S. Attorney Rudolph Giuliani, Dean Guido Calabresi of Yale Law School, Judge Richard Posner of the U.S. Court of Appeals for the Seventh Circuit, and Professor Ronald Dworkin of Oxford University. The Enrichment Program, funded largely by gifts from alumni and friends of the Law Center, includes several endowed lectureships and a visiting scholar program.

#### OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club and several other moot court competitions; (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar, providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

#### THE NATIONAL LAW CENTER COMPLEX

A \$16.7 million expansion program of the physical facilities of the National Law Center was recently completed. The new complex includes the new teaching facility Lerner Hall, a completely renovated Stockton Hall, and the expanded Jacob Burns Law Library. The facade of the new National Law Center is imaginative and integrates a collection of dissimilar buildings into a visual unit. The Center has become a positive addition to the campus, the street, and the neighborhood.



### Lerner Hall

Theodore N. Lerner Hall is one of the most modern and innovative law teaching facilities in the nation. Its five levels contain eight major classrooms, the Dean's suite, and the Moot Court room. Four of the classrooms are constructed in amphitheater style and provide a full range of vision from any seat in the room. The amphitheater classrooms are equipped with the most advanced sound systems and have full video and viewing capacities.

Lerner Hall is a contemporary version of Victorian architecture. It has been described by the *The Washington Post* as "a progressive piece of architecture and urban design."

### Stockton Hall

Stockton Hall contains administrative offices, legal clinics, classrooms, faculty offices, a reading room, a media center, and student lounges.

### The Jacob Burns Law Library

The parameters of the Jacob Burns Law Library have been thoroughly altered by the building expansion. The collections, study areas, and library administrative offices are now located on five instead of eight floors, and a large reading room spanning the entire second floor of Stockton Hall connects Lerner Hall directly to the library. The number of study spaces, at library tables and carrels and in group study rooms and cubicles, has been greatly increased, and lounge areas are available within and close to the library.

The use of a law library is inherently different from the uses of most other libraries. A law library is often likened to the scientist's laboratory. Most law books are used briefly on the premises rather than checked out for thorough reading. Law students spend many of their waking hours in the library, using books or other research facilities. Care has therefore been taken in making the Jacob Burns Law Library not only efficient but beautiful and comfortable.

The collection numbers over 400,000 volumes and volume equivalents. It contains a comprehensive research library of Anglo-American law, including the annotated statutes of the federal government, the 50 states, the territories, and other common-law countries as well as the reported decisions of all these jurisdictions, in all editions and often in multiple copies. The library is especially strong in administrative and regulatory material and congressional coverage. It was designated a United States Government Depository Library in 1978 and is, through this program, acquiring a substantial government documents collection.

The extensive treatise collection covers not only the field of law but law-related disciplines such as business, finance, economics, labor relations, sociology, criminology, psychology, political science, biography, foreign affairs, environmental studies, and others. Especially strong collections are maintained for tax law, labor law, intellectual property law, and international law. A portion of the holdings of the former Library of the Carnegie Endowment of International Peace, acquired by the University in 1950, has been incorporated into the library. Another especially rich component is the periodical collection. A growing proportion of these research materials is collected in a variety of microformats or on audio- or videotapes. In addition to the materials available in-house, the library can gain access to almost unlimited information sources of a legal or law-related nature through the various computer databanks to which it subscribes, such as LEXIS, WESTLAW, Dialog, Nexis, and VU/TEXT.

A permanent staff of 27 persons and many part-time employees administers and maintains the library and offers information, instruction, and other research support services. *Jacob Burns Law Library Readers' Guide*, available at the information



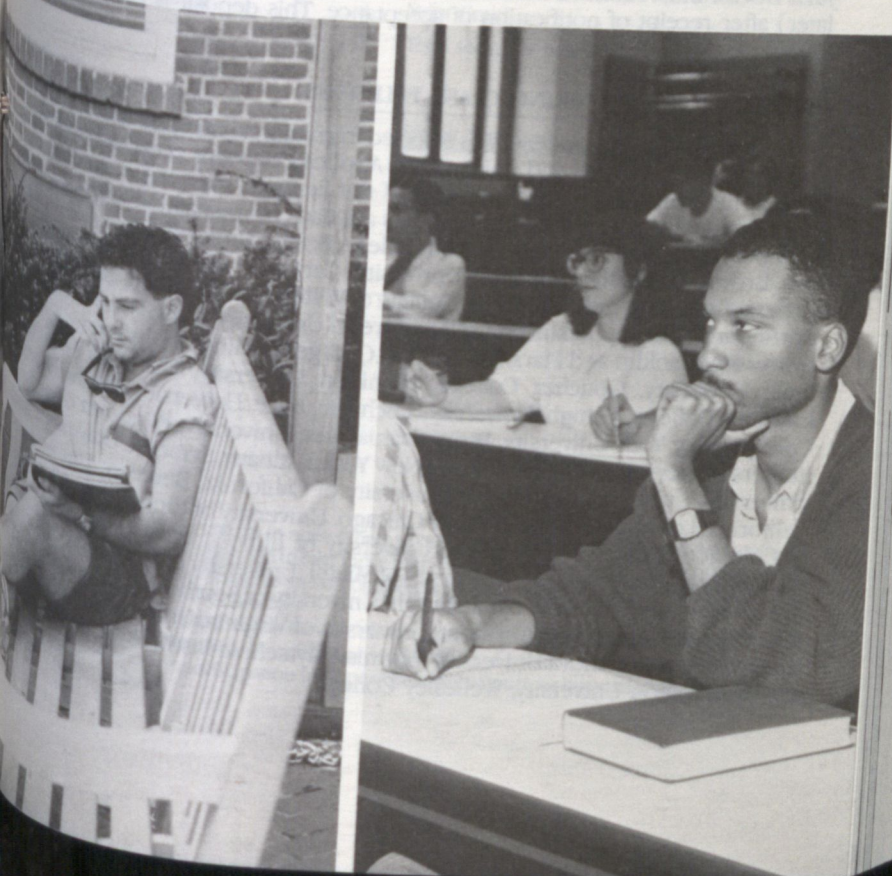
desk, lists library services, hours of operation, collection locations, and other library-related information.

Beyond the resources of the Jacob Burns Law Library, GWU law students have access to the George Washington University Library (Gelman), the Medical Library (Himmelfarb), and other famous libraries in the District of Columbia, including the Library of Congress.

## THE JURIS DOCTOR DEGREE PROGRAM

### ENTRANCE REQUIREMENTS

For information on application for admission to the Juris Doctor degree program, see Admission under General Information. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. Personal recommendations by the faculty, as well as the





benefits the school derives from social, ethnic, cultural, and geographical diversity among its students, are considered. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admissions Office of the National Law Center or from the Law School Admission Services, Box 2000, Newtown, Pa. 18940. The test is administered at various centers in the United States. Testing dates are usually in October, December, February, and June. Completed application forms and fees must be received by the Law School Admission Services at least four weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

#### Advanced Standing

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools that are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of 28 credit hours.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

#### TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a nonrefundable tuition deposit (\$100 initially plus \$350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

#### PROFILE OF THE ENTERING CLASS, FALL 1988

A first-year class of 442 students was selected from more than 6,000 applicants from more than 700 colleges and universities. Applications were received from every state in the union. Forty-seven percent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: Boston College, Boston University, Brandeis University, Brown University, Bucknell University, Carnegie-Mellon University, Colby College, College of the Holy Cross, College of William and Mary, Cornell University, Dartmouth College, Dickinson College, Drexel University, Duke University, Emory University, Franklin and Marshall College, George Washington University, Georgetown University, Goucher College, Hamilton University, Hampton University, Lafayette College, Lehigh University, Michigan State University, Mount Holyoke College, New York University, Pennsylvania State University, Princeton University, Rutgers University, State University of New York at Albany, Syracuse University, Tufts University, University of Arizona, University of California, Berkeley, University of California, Los Angeles, University of Chicago, University of Cincinnati, University of Colorado, University of Florida, University of Illinois, University of Maryland, University of Massachusetts, University of Miami, University of Michigan, University of Pennsylvania, University of Pittsburgh, University of Southern California, University of Texas, University of Vermont, University of Virginia, University of Wisconsin, Vassar College, Villanova University, Virginia Polytechnic Institute and State University, Washington University, Wellesley College.



## THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take Civil Procedure; Constitutional Law I; Contracts; Criminal Law; Legal Research and Writing; Moot Court; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Constitutional Law II, Criminal Procedure, Evidence, Professional Responsibility and Ethics, and the two-credit legal writing requirement.

Beyond these requirements, students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own programs of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of either the fall or spring semester as appropriate.

## DAY DIVISION

First Year		Spring Semester	
Fall Semester			
Contracts I	3	Contracts II	3
Torts	4	Property	4
Criminal Law	3	Constitutional Law I	3
Civil Procedure I	3	Civil Procedure II	3
Legal Research and Writing	2	Moot Court	1
Total semester hours	15*	Total semester hours	14
Second Year		Spring Semester	
Fall Semester			
Constitutional Law II	3	Evidence	4
Elective	11	Elective	10
Total semester hours	14	Total semester hours	14
Third Year		Spring Semester	
Fall Semester			
Elective	12	Elective	14
Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

Students may elect to take 13 credits in one of their upper-class semesters. Prior permission of the dean is required for students who wish to take more than 14 credits per semester after the first year. In the second or third year, students must complete Law 222, *Professional Responsibility and Ethics*, and Law 217, *Criminal Procedure*. This requirement may be satisfied by service on the *Law Review*, by service on the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 314, *Legal Writing*.



## EVENING DIVISION

## First Year

Fall Semester		Spring Semester	
Contracts I . . . . .	4	Contracts II . . . . .	2
Torts . . . . .	4	Criminal Law . . . . .	3
Legal Research and Writing . . . . .	2	Property . . . . .	4
		Moot Court . . . . .	1
Total semester hours . . . . .	10	Total semester hours . . . . .	10

## Second Year

Fall Semester		Spring Semester	
Constitutional Law I . . . . .	3	Constitutional Law II . . . . .	3
Civil Procedure I . . . . .	3	Evidence . . . . .	4
*Elective . . . . .	4	Civil Procedure II . . . . .	3
Total semester hours . . . . .	10	Total semester hours . . . . .	10

## Third Year

Fall Semester		Spring Semester	
*Elective . . . . .	8	Elective . . . . .	10
†Legal writing requirement . . . . .	2		
Total semester hours . . . . .	10	Total semester hours . . . . .	10

## Fourth Year

Fall Semester		Spring Semester	
*Elective . . . . .	10	Elective . . . . .	10
Total semester hours . . . . .	10	Total semester hours . . . . .	10

## Summer Term or Ninth Semester

Elective . . . . .	4
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## REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least two academic years of residence and 56 semester hours are required of students admitted with advanced standing. A student must be registered at the National Law Center for the final semester or summer session preceding graduation. Credits allowed for advanced standing are not included in computing the average required for graduation.

## Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance as a full-time student (11 or more credits) for each of

\*In the second, third, or fourth year, students must complete Law 222, *Professional Responsibility and Ethics*, and Law 217, *Criminal Procedure*.

†This requirement may be satisfied by service on the *Law Review*, by service on the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 314, *Legal Writing*.



the fall and spring semesters constitutes residence for only one academic year, regardless of how many credits over 11 the student takes in any one semester; similar attendance as a part-time student (10 or fewer credits in each semester) constitutes residence for three-fourths of an academic year. Consequently, a full-time student must attend six semesters to meet residence requirements; a part-time student must attend eight. Full-time students authorized to take schedules of less than 11 hours and part-time students authorized to take schedules of less than six hours receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit. These residency requirements apply to all J.D. students in the National Law Center.

### HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three percent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 percent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors" and "With Highest Honors," may not exceed 40 percent of the graduating class.

### ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 percent of the graduating Juris Doctor candidates. Only students who have completed their full course of study at the National Law Center are eligible for membership.

### PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of grades and a writing competition. The editorial board is selected from those students who have successfully completed the first year of *Law Review* work. Students receive 4 semester hours of academic credit for the two-year program.

The *George Washington Journal of International Law and Economics* is managed and edited by law students. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected on the basis of criteria identical to those used by the *Law Review*, and students earn up to four semester hours of academic credit for their work.





### MOOT COURT

The moot court competitions and programs provide realistic training in appellate and trial advocacy. The Moot Court Board, which administers moot court programs at the National Law Center, is a student organization dedicated to promoting excellence in written and oral advocacy. The Board assists the faculty in administering the moot court program for the first-year class and sponsors the Van Vleck Appellate Moot Court Competition, the Jessup Cup competition in international law, the Giles S. Rich competition in patent law, and the Student Trial Lawyers Association trial competition. In addition, the Board sends student teams to international scholastic competitions across the nation.

### LAW CENTER STUDENT ORGANIZATIONS

The Advocate  
Asian-Pacific American Law Student Association  
Black Law Student Association  
Christian Legal Society  
Environmental Law Association  
Equal Justice Foundation  
Federalist Society  
International Law Society  
Jewish Law Student Association  
Law Association for Women

Law Fraternities and Sororities  
Law Students Civil Rights Research Council  
Moot Court Board  
Movimiento Legal Latino  
National Lawyers Guild  
Student Bar Association  
Student Health Law Association  
Student Intellectual Property Law Association  
Student Trial Lawyers Association

### JOINT JURIS DOCTOR-MASTER'S DEGREE PROGRAM

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's



degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration, or Elliott School of International Affairs. Fields in which this program is available include business administration, economics, international affairs, political science, and public administration. Students must be admitted both to the National Law Center and, separately, to the School that will confer the master's degree and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

## MASTER'S AND DOCTORAL PROGRAMS

The administration of justice under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 501-600 series. (Some courses in these areas are included in the 300-400 series.) Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law: Economic  
Regulation  
Corporation Law  
Environmental Law  
Government Procurement Law

International and Comparative Law  
Labor Law  
Land Use Management and Control  
Patent and Trade Regulation Law  
Taxation

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

## MASTER OF LAWS

### Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

### Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either CR (Credit) or NC (No Credit) is assigned. To receive the grade of CR in a course taken in other graduate divisions of this University, a student is required to attain the grade of B or better. To receive the grade of CR in a course taken at



Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of C or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates. The student is expected to include Law 599-600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see Master's Thesis, below).

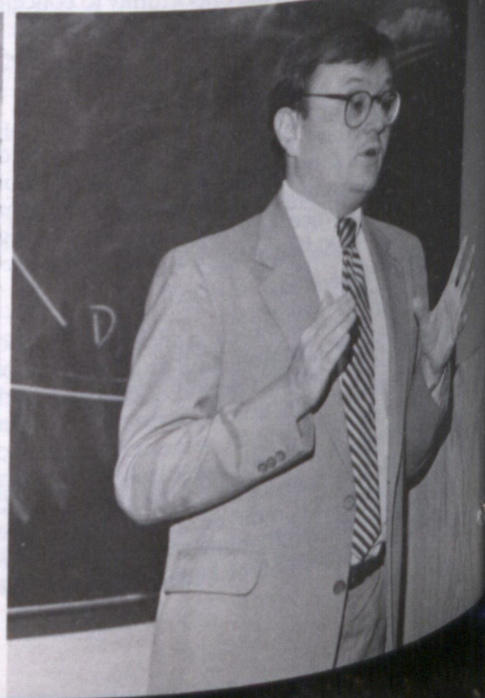
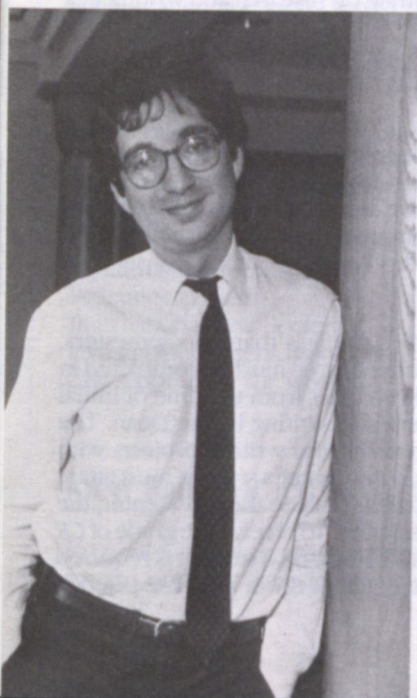
Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field.

The only credit hours that may be applied toward an LL.M. degree are those completed while a duly enrolled candidate for that specific degree, except when an unclassified student has been admitted with the specific right to convert to degree status at the end of a specified number of hours.

### Master's Thesis

Each candidate for the degree of Master of Laws is expected to write a master's thesis (Law 599-600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a law review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the final semester or summer session before the student's graduation, but only if the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver will be granted for candidates for the degree of Master of Laws with specializations in international law, government procurement law, or environmental law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies (three copies in the government





contracts program) are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of \$15 must be paid at the time of registration for the last semester's work.

Accepted theses become the property of the University and are placed in the University's Gelman Library and the Jacob Burns Law Library, where the duplicate copies are bound and made available for circulation.

### Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

### Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however, credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101-200 may be taken for graduate credit only if the student receives the approval of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

### Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the master's degree. Permission to take Consortium courses must be granted by the dean, the registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a grade of *C* or higher.

## DOCTOR OF JURIDICAL SCIENCE

### Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university; a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank, from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law; and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the master's thesis or a copy of one or more papers or articles that the applicant has written. Following consultation with the dean, the applicant must obtain a faculty adviser, to be designated committee chairman, from the regular, full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a detailed outline for the scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation. Once the outline is approved, the applicant's committee is expanded to three members; this consultative committee must recommend the acceptance of the



applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an unclassified student for purposes of completing the 8 semester hours of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the dean.

### Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than 8 semester hours, including Jurisprudence unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar, the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of the dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the dean. Accepted dissertations become the property of the University and are placed in the University's Gelman Library and the Jacob Burns Law Library, where the duplicate copies are bound and made available for circulation.

### DEGREE PROGRAMS FOR INTERNATIONAL STUDENTS

The National Law Center has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: those directed toward preparing students for a bar examination in an American jurisdiction and those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Law Center as a candidate for the Master of Comparative Law (M.Comp.L.) or Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]) degree.

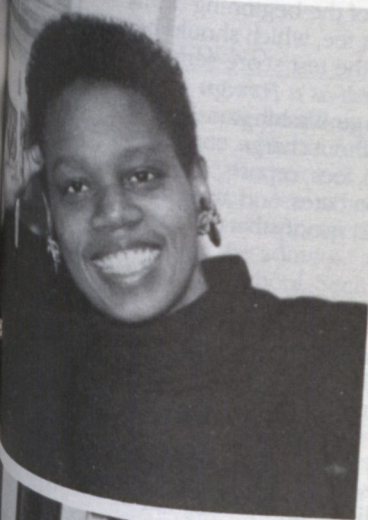
To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. The M.Comp.L. (Am.Prac.) degree requires 32 semester hours of work and satisfies the requirements of the District of Columbia Bar. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*



International students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broad comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination. Courses taken by unclassified students will not be certified for bar admission purposes unless specific arrangements have been made prior to a student's registration in unclassified status.

#### ADMISSION PROCEDURE

Applications for the Master of Comparative Law programs must be received no later than March 1 for the fall semester. Master of Comparative Law applicants may begin their programs in the fall only.





### Required Records

Applicants must request all educational institutions attended to send directly to the Office of Post-J.D. Admissions official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required, but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

### Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 600 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Office of the Dean.

### ENTRANCE REQUIREMENTS

*For the Degree of Juris Doctor*—Entrance requirements for international students are the same as those stated on pages 11–12, except that advanced standing is rarely granted for study in foreign law schools.

*For the Degrees of Master of Comparative Law and Master of Comparative Law (American Practice)*—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; and graduation in law with high academic standing from a recognized foreign university. Admission to the Master of Comparative Law program is limited to the fall semester each year.

*For the Degree of Master of Laws*—An international student will only be considered for admission to the Master of Laws program if he or she has a Juris Doctor or post-Juris Doctor degree with high academic standing from an American university.

*For the Degree of Doctor of Juridical Science*—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

### DEGREE REQUIREMENTS

*Juris Doctor, Master of Laws, Masters of Comparative Law, and Doctor of Juridical Science*—Degree requirements for foreign students are the same as those stated on pages 14, 17, and 20.



*Master of Comparative Law*—The student must complete a residence period of at least two continuous semesters. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses in the Law Center, or in such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 65 at all times. Transfer to the American Practice degree program is not permitted.

*Master of Comparative Law (American Practice)*—The general requirements are the same as those for the degree of Master of Comparative Law except that this degree requires 32 semester hours of course work. However, the courses approved will be limited to the required courses in the Juris Doctor curriculum (see pages 13-14) for those with a civil law background. For those with a common law background, a careful selection of required as well as core elective courses in the Juris Doctor program will be approved. A cumulative average of at least 65 must be maintained at all times.

## UNCLASSIFIED STUDENTS

Two types of students may be admitted to the National Law Center as unclassified students, in accordance with the following regulations:

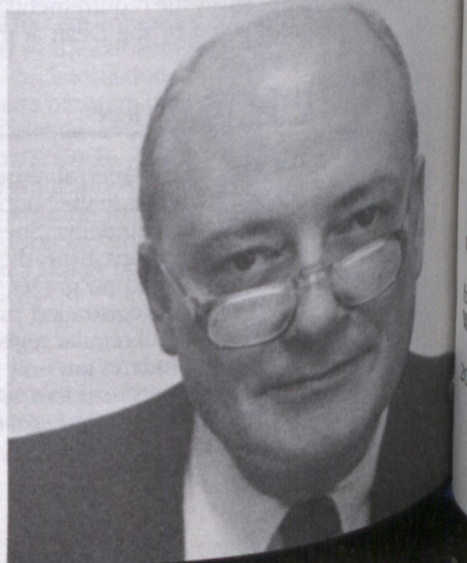
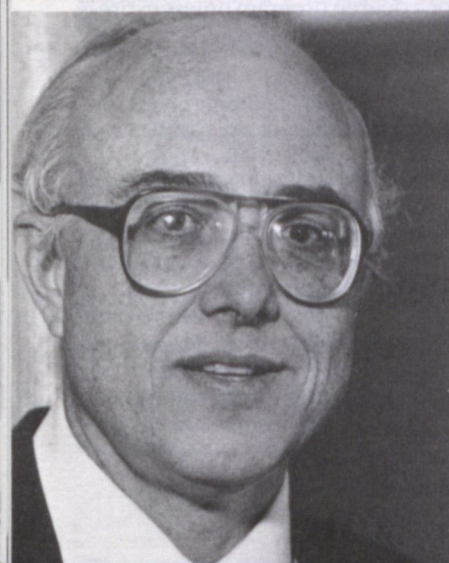
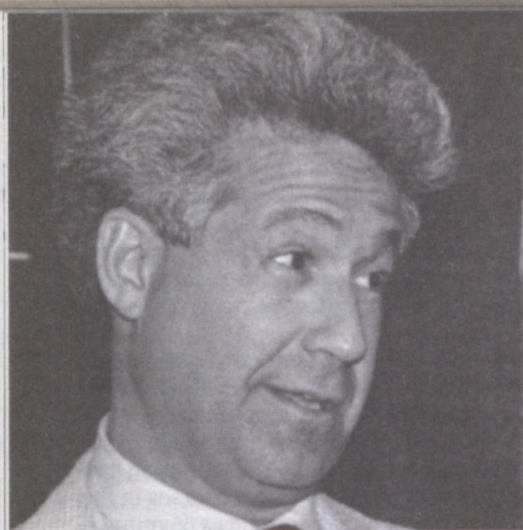
1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school that is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an unclassified student to earn credit for transfer to the other law school. Such students are normally admitted only to the summer sessions. Only a very limited number are admitted to the fall or spring semester.
2. Graduates of law schools that are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as unclassified students.

Unclassified students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an unclassified student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

## CONTINUING LEGAL EDUCATION

Members of the Bar who wish to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Specific courses are also open to non-lawyers whose special qualifications justify their registration. Such students do not take examinations in courses and no grades are recorded for their work. A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)







## GENERAL INFORMATION

The National Law Center has an enrollment of about 1,600 for the J.D. and post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 300 are enrolled in the part-time evening division. More than two hundred students, many from abroad, are enrolled in the post-J.D. degree programs.

### DAY AND EVENING CLASSES

Day classes meet in 50-minute periods, Monday through Friday. Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday.

A four-credit course, e.g., *Evidence*, meets two evenings a week; a three-credit course, e.g., *Administrative Law*, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., *Contracts II*, meets one evening a week. The evening division conforms to the standards of the day division, with the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon. Examinations for day students may be given in the evening.

### SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each summer session by full-time students. Full-time students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by part-time students. Part-time students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

### ADMISSION

Applicants are urged to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process, there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of \$45 must accompany the application.

Forms for application for admission or readmission are available at and should be returned to the Office of Admissions of the National Law Center, George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 23.



## APPLICATION FOR ADMISSION

*Juris Doctor Program*—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS) by completing and mailing the registration forms supplied by the Law School Admission Services (LSAS). No application to this school will be processed unless accompanied by a Law School Application Matching Form, which is found in each applicant's LSAT/LSDAS registration packet. Since an LSAT and/or LSDAS report cannot be produced by LSAS without the Matching Form, it will be necessary to return to the applicant any application received without it. A transcript from each college or university attended should then be sent directly to LSAS, Box 2000, Newtown, Pennsylvania 18940. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others that ordered a report. However, the applicant will be asked, upon acceptance, to submit directly to the National Law Center a final transcript showing evidence of the receipt of a bachelor's degree.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the Law School Admission Test should be taken no later than December (see Entrance Requirements, pages 11-12).

All applications of transfer students should be received by the Admissions Office no later than June 1 for the fall semester, December 1 for the spring semester. Transfer applicants will not be considered for admission to the summer sessions.

For additional information, see the official *Pre-Law Handbook* prepared by the Law School Admission Council and the Association of American Law Schools. The Handbook includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It will be sent to all registrants by the Law School Admission Services.

*Master's Programs*—Students are admitted at the beginning of the fall or spring semester or any of the summer sessions. Application for admission to the LL.M. program, together with all required credentials, must be received by June 1 for the fall semester, October 1 for the spring semester, and one month prior to registration for the summer session for which application is made. Students are admitted in the fall semester only in the Master of Comparative Law program; the application deadline is March 1.

*Doctoral Program*—Students are admitted at the beginning of the fall or spring semester. Application for admission, together with the proposed dissertation topic and all required credentials, must be received by March 1 for the fall semester and October 1 for the spring semester.

*Unclassified Students*—Lawyers who wish to take graduate courses are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credit for transfer toward a Juris Doctor degree at another law school (see page 23), should be received at the Office of Admissions of the National Law Center by June 1 for the fall semester, December 1 for the spring semester, and May 1 and June 1 for the summer sessions.



2. Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 23), should be received at the Office of Admissions of the National Law Center by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

### READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see Application for Admission, above).

If the student has attended one or more institutions of higher education during absence from the University or applies as a degree candidate and was previously a nondegree student, he or she must have complete, official transcripts sent to the dean.

### REGISTRATION

Before attending classes each student must register in person. No student will be registered until proper credentials have been filed and approved (see Admission).

No registration is accepted for less than a semester or one summer session. A student may not register concurrently in George Washington University and another institution. Registration in more than one school of the University requires the written permission of the deans concerned, *prior to registration*.

Registration may be changed only with the permission of the dean.

### ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

*New Student*—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

*Readmitted Student*—A student previously registered who was not registered for courses during the preceding semester or summer session must apply for and receive a letter of readmission (see Readmission, above) before becoming eligible for registration.



## FEES AND FINANCIAL REGULATIONS

The following fees and financial regulations were adopted for the 1989 summer sessions and the 1989-90 academic year.

### Tuition Fees

J.D. candidates:	
Full-time program (11 or more hours), each semester	\$6,750
Part-time program, each credit hour	482
Master's degree candidates (LL.M., M.Comp.L., and M.Comp.L. [Am.Prac.] and Continuing Legal Education students, each semester hour	366
S.J.D. candidates,* full program, including the final examination	13,500

Marvin Center Fee (charged all students registered on campus)	10.75
Each semester hour, to a maximum of \$112.50 per semester	

Registration Fee (charged all students per semester and summer registered)	25
	75

Graduation Fee (charged all students applying for graduation)	45
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### Special Fees

Application fee (degree candidate), nonrefundable	450
Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—\$100, nonrefundable, by a date specified in the letter of admission; \$350, nonrefundable, by June 1)	15
Fee for binding Master's theses and S.J.D. dissertations	50
Late-registration fee, for failure to register within the designated period:	100
During first week of classes	
After first week of classes (if permitted)	15
Late-payment fee, charged for failure to make payments when due (see Payment of Fees, below)	5
Replacement of lost or stolen picture identification card	35
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)	15
Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason	2
Transcript fee	

Registration on campus in the University entitles each student to the following privileges: the services of the Career Services Center; the use of the University library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; and the *Hatchet*, the student newspaper. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

\* The tuition fee is to be paid at the rate of \$3,375 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain enrollment.



## PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the ninth week of classes for the fall and spring semesters. Interest at the rate of 12 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government payment contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by \$1,500 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a 15 late-payment fee and will be subject to the interest charge of 12 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is paid in full. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of \$35.

**Returned Check Policy**—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 30 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

## UNPAID AND DEFERRED PAYMENT PLANS

Several commercial programs are available for those who wish to pay the costs of their education on a monthly basis. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Student Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899

Knights-Chester Insured Tuition Plan, 53 Beacon Street, Boston, Mass. 02108

Education Loan Program, The Riggs National Bank, 1913 Massachusetts Ave., N.W., Washington, D.C. 20035

Student Line, Inc., Concord, N.H. 03301

Student Line, Maryland National Bank, Consumer Banking Division, P.O. Box 1954, Baltimore, Md. 21203



### WITHDRAWALS AND REFUNDS\*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
 

Withdrawal dated on or before Friday of the first week of classes. . . . .	80%
Withdrawal dated on or before Friday of the second week of classes. . . . .	60%
Withdrawal dated on or before Friday of the third week of classes. . . . .	40%
Withdrawal dated on or before Friday of the fourth week of classes. . . . .	25%
Withdrawal dated after the fourth week of classes. . . . .	None
2. *Partial withdrawal*: If the change in program results in a lower charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes. Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

### FINANCIAL AID

The National Law Center assists many students in obtaining financial aid through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

### JURIS DOCTOR PROGRAM

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSEAS), which provides an analysis of an applicant's financial need. Entering students wishing to receive financial aid should request the materials from GAPSEAS, Educational Testing Service, P.O. Box 6660, Princeton, New Jersey 08541-6660. The information provided by the applicant and the applicant's parents will be analyzed and a copy of the report will be sent to the Law Center.

Students entering the National Law Center who wish to apply for a scholarship must submit a letter to the Assistant Dean for Admissions, outlining their academic qualifications, extracurricular activities, and reasons for believing a scholarship is justified.

\* The \$450 deposit required of entering students is nonrefundable. Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Announcement*.



Students seeking financial assistance should file with GAPSEAS in time for their reports to be received at the Law Center as early as possible. Applications for scholarships should be submitted by March 1 or within one month of acceptance by the Law Center. The Committee on Student Financial Aid of the Law Center will begin making awards in March, and available funds are limited.

*No awards will be made to an entering student until the admission process has been completed.*

### Sources of Financial Aid

Financial aid has been made available from many friends and alumni of the Law Center. The scholarships include the following:

Arant, Fox, Kintner, Plotkin & Kahn Scholarship	Jacob and Charlotte Lehrman Foundation Scholarship
Mildred Gott Bryan Scholarship	Manatt-Phelps Banking Law Scholarship
Jacob Burns Scholarship	Robert Netherland Miller Scholarship
Charles Worthington Dorsey Memorial Scholarship	Phi Delta Delta Scholarship
Samuel Green Phi Delta Phi Scholarship	Donald C. Snyder Scholarship
Patricia Roberts Harris Scholarship	William Pinckney Walker Memorial Scholarship
Howrey and Simon Scholarship	Glen A. Wilkinson Scholarship
Huntton and Williams Scholarship	J. McDonald and Judith K. Williams Scholarship
Thomas Searing Jackson Scholarship	

In addition, the University awards a number of Honor and Trustee Scholarships and offers tuition remission on the basis of financial need.

### Loan Funds

Through the generosity of friends of the University, a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnell Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the Mitchell Cutler Memorial Loan Fund; the J. Forrester Davison Loan Fund; the Clifford A. Dougherty Fund; the District of Columbia Bar Association Loan Fund; the J.W. Hartlich Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Louise F. Beneman Memorial Student Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Frederick O. Graves Law Student Loan Fund; the John B., Jr., and Carol H. Holden Loan Fund; the Jephson Educational Trust Loan Fund; the Susan and Gene Kondrup Memorial Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hassler Walburn Memorial Loan Fund; the Kennedy and Judith Williams Law Student Loan Fund; the Ralph E. West Memorial Loan Fund; the W.H. Wilson Memorial Student Loan Fund; the Patricia A. Willoner Loan Fund; the Ruth Wilson Loan Fund; the Yadao and Kanemoto Loan Fund; and the Samuel Green Memorial Loan Fund.



In addition, financial assistance is available through the Guaranteed Student Loan Program, Perkins Loans, work-study, and other sources. Application for financial assistance should be made in the Office of the Dean.

### MASTER'S AND DOCTORAL PROGRAMS

Application should be made by March 1 or within one month of acceptance by the Law Center. The applicant should submit a letter applying for financial aid to the Assistant Dean for Admissions. The letter should contain biographical data, information concerning experience in practice or teaching, and any other information that will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Assistant Dean for Admissions. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Sources of financial aid include the Marcus B. Finnegan Memorial Fellowship in the field of international intellectual property, Richard Paul Momsen Scholarships for Brazilian Graduate Law Students for the study of U.S. constitutional law and the law of patents and trademarks, Randolph C. Shaw Graduate Fellowships in Administrative Law, and up to three University Teaching Fellowships for students appointed to conduct sections of the first-year research and writing course.

### PRIZES

*Bureau of National Affairs Law Student Prize*—Presented to an outstanding senior law student.

*Jacob Burns Prize*—Established by Jacob Burns, a law alumnus and Honorary Trustee of the University. A medal and a cash award presented annually to each of the two members of the winning team in the upper-class Van Vleck Moot Court competition.

*The Michael D. Cooley Memorial Prize*—A plaque given to that individual in each graduating class who has been most successful in maintaining his or her compassion, vitality, and humanity during law school. The recipient of this award is selected by the graduating class during the spring of the third year at the National Law Center.

*Ogden W. Fields Graduate Prize*—Awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

*Charles Glover Prize*—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. A cash award given annually





to the student who has attained the highest average grade in the third-year, full-time course.

**Kappa Beta Pi Prize**—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

**John Bell Larnier Prize**—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course of the degree of Juris Doctor.

**John Ordronaux Prizes**—By bequest, awarded annually to the student who has attained the highest average grade in the first-year, full-time course and to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

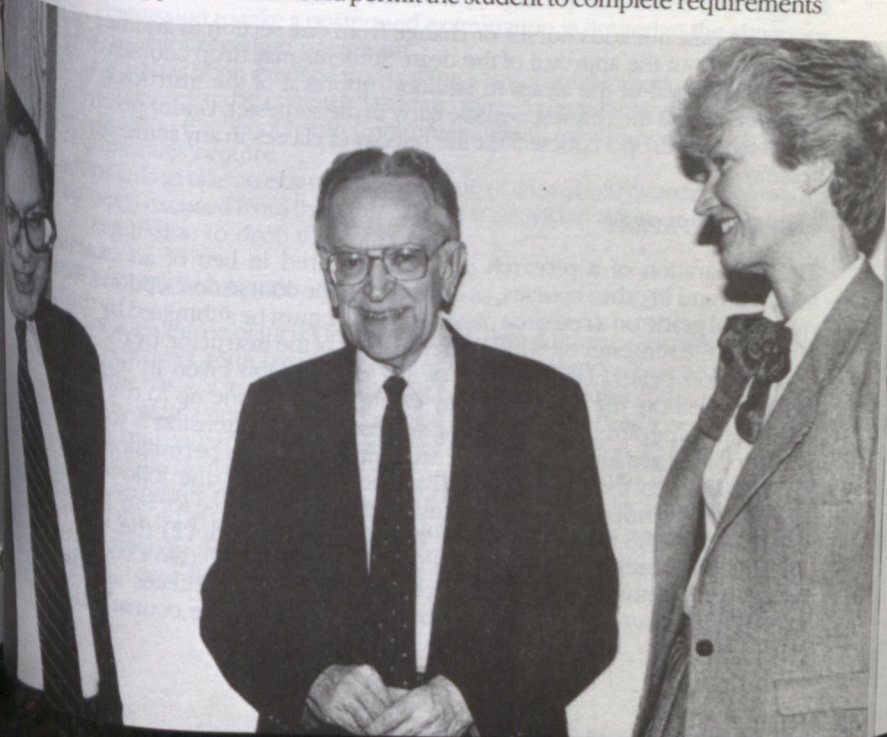
**Jennie Hassler Walburn Prize**—A cash award to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

**Imogen Williford Constitutional Law Prize**—Established by Imogen Williford, J.D. 1929. A cash award presented to the outstanding student in the field of constitutional law.

## REGULATIONS

### ACADEMIC WORK LOAD

**Juris Doctor Candidates**—Juris Doctor candidates without substantial outside employment may take a program of studies of 15 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and if a majority of the hours taken are in day courses. The dean is authorized to approve programs of study of more than 15 hours in exceptional cases; however, no program will be approved that would permit the student to complete requirements





for the degree in less than 28 months after beginning the first year of law study. Students with more than 20 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours, except in special cases when 6 hours may be approved by the dean for a limited time. A minimum schedule for 11 hours in the day division is required except in unusual circumstances when a reduced program is authorized by the dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the dean to take a Bar Review course.

Students may transfer from the day division to the evening division only with the permission of the dean.

With the approval of the dean, second- and third-year students may take a maximum of 6 semester hours of appropriate graduate-level courses in other departments of the University; such a student must receive a grade of at least *B* to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

*Master's Candidates*—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with more than 20 hours of outside employment must take a limited program of study not to exceed 8 hours a week. The minimum load is 4 hours unless approval for fewer hours is given by the dean for a limited time.

### ATTENDANCE

Regular attendance at classes is required and is necessary for successful work. A student who is deficient in class attendance in any course may be barred from taking the examination.

### CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of the same course without the approval of the dean. Students may drop courses only with the written approval of the dean. In addition, approval of the instructor is ordinarily required unless the request is made early in the semester. Under no circumstances may a student drop a course after the last day of classes in any semester or summer session.

### RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. To receive a numerical grade on a research paper, the paper must be submitted by the last day of the classes in the semester or, with the permission of the instructor, by the last day of the examination period (the last day of any examination given in any course). For sufficient reason, the instructor may extend the deadline up to the last day of the examination period of the following semester; if the extension is to a date beyond the normal graduation date for the student, the express permission of the dean is required. When the deadline for a paper is extended, the following conditions apply: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit). To receive credit, a minimum grade of 65 is required for J.D. candidates and 75 for LL.M. candidates. Failure ultimately to submit any paper for the course will result in a



grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester; with the approval of the dean such students may register for more than one such course each semester.

The following guidelines have been approved by the faculty and are intended to apply to Law 314, *Legal Writing*, and to research paper courses that satisfy the legal writing requirement. The faculty recommends that the paper's topic and length should receive specific approval by the faculty member. Furthermore, an outline should be submitted, to be followed by a draft. (The purpose of a draft, submitted during the course of the semester, is to allow the student the opportunity to improve the paper. A faculty member has the discretion to require a revised draft or to permit one if so requested by the student. A revised draft is necessary only if the professor requires it.) Approval of the topic, outline, and draft should be by a specified date. The paper should follow the Blue Book style.

### EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a makeup examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit (minimum grade of 65 required for J.D. candidates and 75 for LL.M. candidates) or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the dean's permission to drop the course.

### CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 6 semester hours of elective course work on a Credit/No Credit basis; a grade of Credit will be recorded if the course is satisfactorily completed with a grade of 65 or better. The Credit/No Credit option may be selected for only one course during a semester or summer session. The final date for an election of Credit/No Credit in an elective graded course will be the Friday of the third week of a semester, the Friday of the third week of a six-week summer session, or the Friday of the third week of a 13-week summer session. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of 45 for a course taken on a Credit/No Credit basis.



No student may take more than 17 semester hours of courses (including Law 220 and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

### GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85-100, A, Excellent; 75-84, B, Good; 65-74, C, Satisfactory; 55-64, D, Poor—below standard for graduation; 45-54, F, Failure. In Law courses 220, 321-22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, 593, and 620 grades are CR, Credit (minimum grade of 65 required for J.D. candidates, 75 for LL.M. candidates); NC, No Credit. In Law 220, the grade of H (Honors) may be earned for work of excellent quality. A student who has been excused from taking a regularly scheduled examination is given the grade of I, Incomplete. See Examinations (above) for grade upon failure to take an examination. Grades between 55 and 100 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. and M.Comp.L. candidates for grades below 55 or to LL.M. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the Law Center or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (F) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken





course is entered into the student's record in addition to the original grade and both grades are included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree.

#### EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

*Candidates for the Degree of Juris Doctor*—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to 65.0 at the end of the next semester, the student will not be permitted to register for any succeeding semester unless he or she petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which he or she was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond his or her control and that he or she has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

*Candidates for Master's and Doctoral Degrees*—A candidate for a Master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 is required for the Master of Laws degree and a cumulative average of 65 for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the dean. Such student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the dean or the Board for Graduate Studies.

*Unclassified Students*—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.



### SUMMER SCHOOL CREDIT

Students planning to attend summer sessions at other law schools and desiring to use the credit toward their Juris Doctor program at the Law Center must first have the courses they wish to take approved by the dean. Students may not take courses in summer sessions at other law schools in this vicinity if the same courses are being given during the summer sessions at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in a similar period in this program. Students who register at another law school must provide the dean with an official transcript of their work there promptly on its completion.

### TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of \$2 is charged for each transcript.

### CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until *all* degree requirements are satisfied. By failing to register for one semester or more, the student breaks registration and must be readmitted (see Readmission, page 27). A readmitted student is required to satisfy the curriculum requirements existing at the time of readmission.

### GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

*Application for Graduation*—An Application for Graduation must be filed by the dates indicated in the Calendar (pages 5–6) during the last semester or summer session of the final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions. If they wish, such students may participate in the Winter Convocation.

### ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty.



Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

#### UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

#### RIGHT TO CHANGE RULES

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force when the proper authorities may determine.

#### RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

#### RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.



### PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

### STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Guide to Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, including the Code of Student Conduct, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the office of Judicial Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

### UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of the law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.





## STUDENT SERVICES

### RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing and Residence Life Office refers graduate students to apartments as they become available in University-owned buildings in the campus area. Additionally, the University's Off-Campus Housing Resource Center can provide information and assistance for those seeking accommodations.

### FOOD SERVICE

Contract food service is available from August to May, based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. Rates for the various meal plans are available from the Housing and Residence Life Office. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash-equivalency basis in the Marvin Center first floor cafeteria and in George's on the fifth floor.

### CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations. The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This board works closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

### STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located at 2150 Pennsylvania Ave., N.W. (entrance on 22nd Street).

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service at no cost. Many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. Students who desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory



work, and referrals to specialists or other outside physicians) are the responsibility of the student.

### Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

### STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to not more than 20 hours (see Academic Work Load, page 36). It is urged that all full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed for adequate study and preparation, which are at the heart of a good legal education.

### CAREER DEVELOPMENT AND PLACEMENT SERVICES

The Career Development Office provides a full range of services to support the career decision-making process. Students, graduates, and prospective employers are served through a variety of programs, including systems of job-vacancy advertising; newsletters of current career information; individual and group counseling on resume preparation, interviewing skills development, and job-search strategy; a career resource library; and forums and panel presentations covering legal career topics as well as employment options.

A strong campus interviewing program is organized in the fall of each academic year to enable prospective employers to interview second-year students for summer positions and third- and fourth-year students and LL.M. candidates for permanent positions. In 1988, the 434 participating employers represented 39 states and the District of Columbia and included private law firms, legal services offices, corporations, government agencies, accounting firms, and District Attorney's offices.

During the fall of 1988, the Career Development Office conducted regional off-campus interviewing programs in New York City, New England (Boston), Philadelphia, Northern California (San Francisco), Southern California (Los Angeles), and Miami (the last program was offered in cooperation with the Georgetown University Law Center). These programs supplemented the campus interviewing process by providing students exposure to 96 firms and organizations that did not interview on the George Washington University campus.

In addition to the structured interviewing programs offered during the fall, the Career Development Office organizes other options for employer/student contact. Approximately 115 employers who were unable to interview on the George Washington University campus requested that the Career Development Office collect resumes for their review and follow-up. Other employers requested that students contact them directly. Through this process, 483 summer positions and positions for 1989 graduates were listed.

The National Law Center is a member of the Consortium of Washington, D.C., Area Law Schools, which sponsors the Public Service/Public Interest Interviewing Day early in the spring semester. During the past year, 39 organizations representing government agencies, public interest organizations, and legal services offices interviewed students for specific job openings.



The Career Development Office held its second annual Washington, D.C., metropolitan area, small-firm interviewing program in the spring of 1989. The purpose of this regionally targeted program is to increase the number and variety of legal opportunities for 50-60% of the graduating class who wish to locate employment with small firms in the metropolitan area. A total of 40 firms participated over two days of interviews. Invitations were mailed to all law firms with 30 or fewer attorneys in the D.C. metropolitan area.

The Career Development Office publishes a newsletter, *Noteworthy*, distributed biweekly to all students to keep them informed of upcoming programs, application deadlines, general career news, trends in hiring, bar examination rule changes, and other pertinent information. The Office also distributes to alumni the *Graduate Career Opportunities Newsletter*, which advertises current job openings of local and national interest that are concurrently advertised in the Career Development Resource Library.

Each year in February, the Career Development Office conducts a survey of the previous year's graduates. Responses from 299 members of the 1988 graduating class showed 61% in private practice, 14% in government (including the military), 8% in judicial clerkships, 6% in business and industry, 1% in legal services and public interest, and 10% in other positions. The highest concentration of graduates (50%) is in the South Atlantic region, which includes Delaware, the District of Columbia, Maryland, Virginia, West Virginia, Georgia, Florida, and North and South Carolina. New York, New Jersey, and Pennsylvania are home to 15%, and 5% are located in the New England states. The Pacific Coast states (and Hawaii) drew 8%, and the East North Central states attracted 4%. Small percentages went to a number of other states and foreign countries.

#### VETERANS BENEFITS

The veterans counselor, located on the third floor of Rice Hall, 2121 I Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest. The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

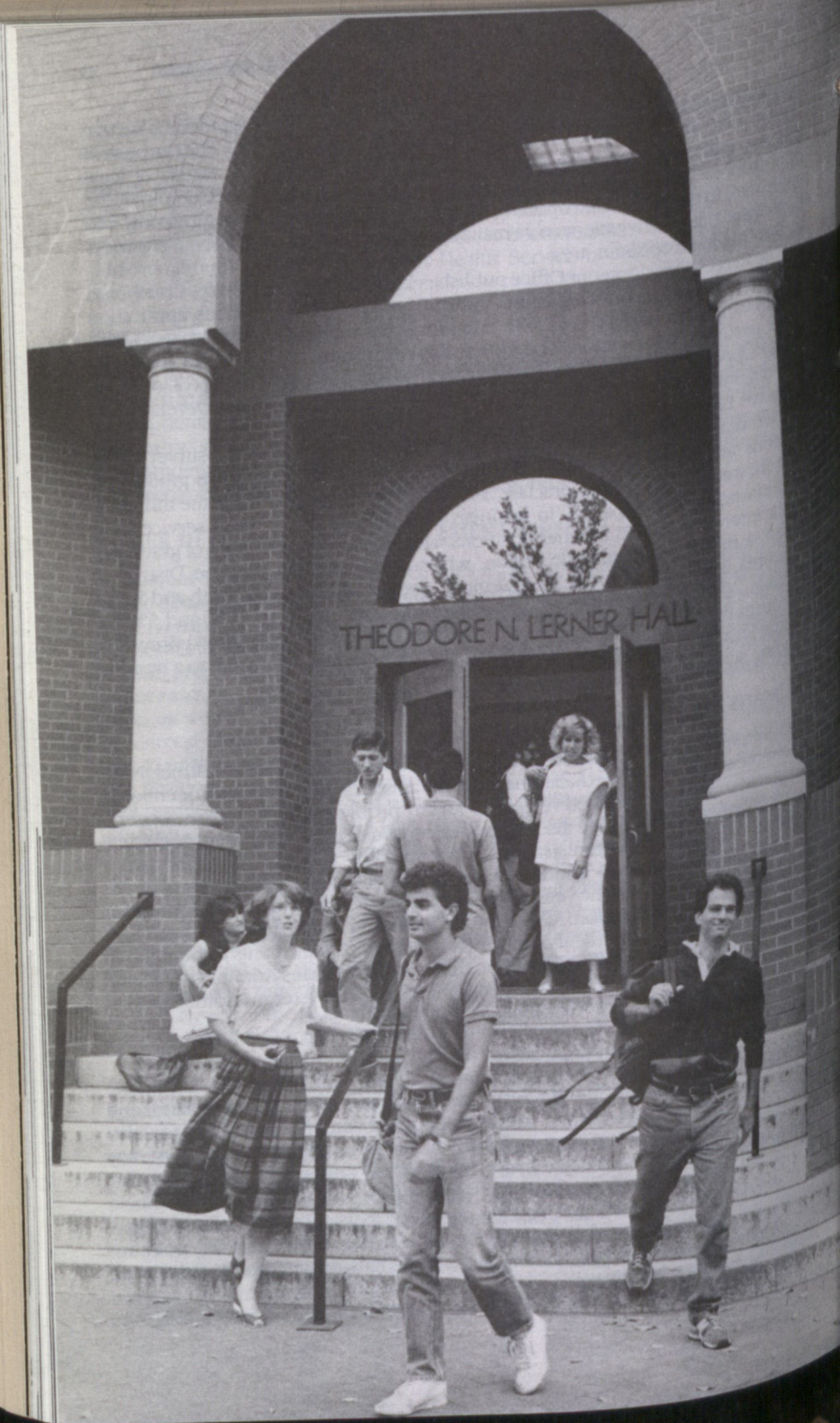
#### DISABLED STUDENT SERVICES

The Director of Disabled Student Services coordinates advising, orientation, and special services that address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The office is located on the fourth floor of Rice Hall, 2121 I Street, N.W.











## COURSES OF INSTRUCTION

### CAREER PLANNING AND COURSE SELECTION

One of the great strengths of the National Law Center is the diversity of its course offerings and the flexibility it offers students to design their programs to fit their interests and career plans. Every spring a series of counseling sessions is held to provide students with an overview of course offerings in various areas of the law and to assist them in selecting courses and defining their career objectives. Students also may consult members of the faculty for course and career planning. In addition, the Career Development Office provides a central storehouse of information regarding many types of legal careers.

While the curriculum after the first year is largely elective, the faculty believes that exposure to certain course work is important. Consequently, the faculty strongly recommends that all students take Administrative Law (342), Corporations (327), Taxation—Federal Income (420), and Trusts and Estates I (390).

The faculty also believes that a generalist J.D. program would normally include most of the following courses and recommends that students take most of them prior to graduation: Conflict of Laws (440), Federal Antitrust Law (452), Labor Law (338), Remedies (380), and one or more of the following: Commercial Paper, Check Collection, and Banking (372), Creditors' and Debtors' Rights (378), and Sales and Sales Financing (370). In addition, the faculty believes that students should consider taking a course that will provide a cross-disciplinary perspective on the law, such as legal history, comparative law, jurisprudence, law and economics, and law, science, and technology.

The Law Center's broad offering of elective courses is listed below. Courses numbered 500 and above are generally more advanced but are open to second- and third-year students who have taken the prerequisite courses. Both second- and third-year students may take more than one such course with the permission of the Dean.

Among the courses offering clinical work are: Law 414, 460, 483, 492, 493, 495, 496, 497, 498, and 596.

The courses of instruction listed below are subject to change. The University reserves the right to withdraw any course announced.

### ELECTIVE COURSES AND SEMINARS (300-499)

Administration of Government  
Contracts (489)  
Administrative Law (342)  
Advanced Civil Procedure: Complex  
Litigation (308)  
Agency and Partnerships (322)  
Air Pollution Control (411)  
American Legal History (Seminar)  
(318)  
Banking Law I (332)  
Business Planning (334)  
Civil Rights Legislation (359)  
Clinical Law Work (492)

Clinical Studies in Environmental Law  
(414)  
Clinical Studies in Urban Law (497)  
Collective Bargaining and Labor  
Arbitration (340)  
Commercial Paper, Check Collection,  
and Banking (372)  
Community Property/Marital Property  
(394)  
Comparative Law (438)  
Conflict of Laws (440)  
Constitutional Law (Seminar) (350)  
Corporations (325)



- Creditors' and Debtors' Rights (378)  
 Current Decisions (364)  
 Current Problems in Land Use Management Controls (Seminar) (403)  
 Disabled People and the Law (482)  
 Domestic Relations (434)  
 Drugs and the Law (Seminar) (474)  
 Environmental Law (410)  
 Estate Planning (Seminar) (395)  
 Federal Antitrust Laws (452)  
 Federal Jurisdiction (300)  
 Foreign Relations, National Security and the Constitution (443)  
 Government Contracts (Seminar) (490)  
 Government Contracts (486)  
 Government Contracts Cost and Pricing (491)  
 Government Procurement Law (487)  
 Immigration Law (360)  
 Insurance (382)  
 International Business Transactions (446)  
 International Law (444)  
 International Organizations (447)  
 Journal of International Law and Economics (366)  
 Jurisprudence (442)  
 Labor Law (338)  
 Land Development Law (408)  
 Land Use Administrative Process (404)  
 Law and Accounting (324)  
 Law and Criminology I (478)  
 Law and Criminology II (479)  
 Law and Medicine (472)  
 Law and the Deaf Clinical Education Activities (483)  
 Law, Science, and Technology (Seminar) (475)  
 Law Students Civil Rights Research Council (496)  
 Law Students in Court (495)  
 Legal Activism (498)  
 Legal Aid (493)  
 Legal Writing (314)  
 Local Government Law (409)  
 Mediation (303)  
 The Modern Corporation (Seminar) (336)  
 Modern Real Estate Transactions (398)  
 Moot Court (312)  
 Occupational Safety and Health Legislation (415)  
 Patent Law (464)  
 Patent Office Practice (466)  
 Performance of Government Contracts (488)  
 Planning, Zoning, and Land Use Law (402)  
 Problems of the Consumer (460)  
 Products Liability (454)  
 Public Policy and Mass Media (352)  
 Regulated Industries (345)  
 Remedies (380)  
 Research and Writing Fellow (368)  
 Sales and Sales Financing (370)  
 Securities Regulation (326)  
 Taxation—Federal Estate and Gift (422)  
 Taxation—Federal Income (420)  
 Taxation—Federal Income, Corporations and Shareholders (424)  
 Taxation—Partnerships and Subchapter S (426)  
 Toxic Tort Litigation (455)  
 Trial Advocacy (311)  
 Trial Practice Court (302)  
 Trusts and Estates I (390)  
 Unfair Trade Practices (450)  
 Women and the Law (484)

#### ADVANCED COURSES AND SEMINARS (NUMBERED 500-699)

- Accounting Aspects of Federal Income Taxation (573)  
 Chemical Patent Practice (553)  
 Chinese Law (570)  
 Communications Law (572)  
 Comparative Environmental Law (551)  
 Control of Toxic and Hazardous Substances (RCRA & CERCLA) (548)  
 Copyright Law (559)  
 Crime Lab, the Forensic Scientist, and the Criminal Lawyer (532)  
 Energy (549)  
 Environmental Planning (544)



Equal Employment Claims and Litigation (527)  
 Equal Employment Opportunity (524)  
 Food and Drug Law (509)  
 Graduate Clinical Studies (596)  
 Health Care Delivery Systems (Seminar) (508)  
 Income Taxation of Foreign Business and Investment (583)  
 Independent Studies (597)  
 Internal Union Affairs (522)  
 International and Comparative Patent Law (558)  
 International Humanitarian Law of Coercion Control (568)  
 International Law of Air and Space (566)  
 International Law of Human Rights (565)  
 International Law of the Sea (567)  
 International Negotiations (571)  
 International and U.S. Regulation of Foreign Trade (505)  
 Labor Litigation Seminar (526)  
 Labor Relations in the Federal Service (521)  
 Labor Standards (520)  
 Law and Economics (502)  
 Law of Criminal Corrections (535)  
 Law of the European Communities (561)  
 Law of Real Estate Financing (538)  
 Legal Research and Writing (Foreign Students) (620-621)  
 Legislative Drafting (591)

Natural Resources Law (546)  
 Negotiation: Concepts and Techniques (563)  
 Patent and Know-how Licensing (552)  
 Patent Law, Advanced Topics (554)  
 Practical Economics for Lawyers (500)  
 Public Economic Policy and the Law (501)  
 Regulation of Chemicals (FIFRA & TSCA) (545)  
 Research in Patent, Trademark, and Copyright Law (555)  
 Research in Public Law (598)  
 Soviet Law (569)  
 Survey of the Secondary Mortgage Market (539)  
 Tax Practice and Procedure Seminar (588)  
 Income Taxation of Property Transactions (584)  
 Taxation—Deferred Compensation I (586)  
 Taxation—Exempt Organizations (578)  
 Taxation—Real Estate and Income (579)  
 Taxation—Special Corporation Problems (577)  
 Taxation—State and Local (581)  
 Thesis (599-600)  
 Use and Control of Nuclear Energy (550)  
 Water Pollution Control (547)  
 Water Resources Law (543)

#### COURSES NOT OFFERED 1989-1990

Administration of Criminal Justice (Seminar) (307)  
 Administrative Law (Seminar) (344)  
 Administrative Practices and Procedures (Food and Drug Administration) (510)  
 Admiralty (386)  
 Advanced Corporations and Securities Topics (Seminar) (337)  
 Advanced Problems in International Business Transactions (506)  
 Advanced Problems in Public International Law (504)  
 Appellate Practice and Procedure (304)

Arms Control and Strategic Stability (564)  
 Banking Law II (333)  
 Civil Procedure (Seminar) (310)  
 Computers and the Law (468)  
 Corporate Finance (329)  
 Criminal Practice (Seminar) (534)  
 Federal Income Taxation of Trusts, Estates, and Beneficiaries (585)  
 Individual Rights and Liberties (358)  
 Intergovernmental Relations I (541)  
 International Arbitration (448)  
 International Civil Litigation (449)



- International Law (Seminar) (448)
- Labor Law (Seminar) (341)
- Law of Congress and the Presidency (Seminar) (347)
- Law of Japan (562)
- Law of the Near East (574)
- Law of Privacy (469)
- Law and Psychiatry (Seminar) (437)
- The Legal Process (320)
- Legislation (362)
- Medicine for Lawyers (470)
- Police and the Community (480)
- Public-Sector Labor Law (Seminar) (529)
- Regulation of Investment Advisers and Investment Companies (507)
- Regulation of Securities Markets and Professionals (328)
- Special Problems of Tax Policy (Seminar) (428)
- Statistics and the Law (503)
- Takeovers and Tender Offers (327)
- Taxation—Deferred Compensation II (587)
- Taxation—Oil and Gas (580)
- Taxation—Principles of Charitable Tax Planning (582)
- Trade Regulation (Seminar) (462)
- Trusts and Estates II (391)
- U.S. Trademark Law (560)

### COURSE DESCRIPTIONS

The courses of instruction are described below. The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, an academic-year course with two hours of credit each semester is marked (2-2) and a semester course with two hours of credit is marked (2).

In most courses, a final examination is held during the examination period and the grade in the course is determined in large part by that examination. These courses are marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. Only research papers qualify for the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring.

### REQUIRED COURSES

203-4 Contracts I-II (3-3 day)

(4-2 evening)

Nash, Cibinic, Pock, Prince,  
Caplan, Wilmarth

Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries;



- effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)
- 207 **Torts (4)** Seidelson, Banzhaf, T. Schwartz, Schechter, Knapp  
Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)
- 211 **Property (4)** Starrs, Schiller, Chandler, J. Schwartz, Johnston  
Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interest at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Spring—day and evening)
- 213 **Constitutional Law I (Federal Systems) (3)** Barron, Park, Cheh, Dienes, Nolan  
Basic principles of American constitutional law, with a focus on governmental powers and the role of the Supreme Court in interpreting and enforcing constitutional norms. The nature and scope of judicial review. The case and controversy requirement and other limitations on constitutional adjudication. Powers of the president and Congress; the separation of powers doctrine. Relationship of the national government to state governments and principles of federalism. The state action doctrine. (Examination) (Spring—day; fall—evening)
- 214 **Constitutional Law II (3)** Barron, Park, Cheh, Dienes, Nolan  
Individual rights and liberties in the American constitutional scheme and the different judicial methods of reconciling majoritarian governance with individual freedom. Privileges and immunities of national citizenship, due process of law, equal protection guarantees, freedom of expression and of religion, rights of privacy and association. (Examination) (Fall—day; spring—evening)
- 216 **Criminal Law (3)** Starrs, Robinson, Sirulnik, Caplan, Craver  
An overview of the criminal justice system; dimensions of the problem of crime and goals of penal sanctions. An examination of what conduct should be made criminal and what sanctions should be applied. The theoretical anatomy of a criminal offense (elements of *mens rea* and *actus reus*), the general principles of criminal liability, and the various defenses. Special problems, such as conspiracy, inchoate crimes, causation, insanity, and complicity, are subjected to detailed analysis. (Examination) (Fall—day; spring—evening)
- 217 **Criminal Procedure (3)** Starrs, Robinson, Sirulnik, Caplan, Cheh  
Comprehensive presentation of major issues in criminal process, with heavy reliance on Supreme Court cases interpreting the constitution. The course proceeds through the criminal justice system, from first police contact, search interrogation, and other investigation, through the prosecution, preliminary proceedings, and trial. Problems of federalism, the exclusionary rule, and sentencing. (Examination) (Fall and spring—day)
- 218-19 **Civil Procedure I-II (3-3)** Friedenthal, Sharpe, Raven-Hansen, Trangsrud, Hoptman, Peterson  
The theory and practice of civil litigation. Analysis of the goals, values, costs, and tensions of an evolving adversarial system of adjudication. Examination of the rules and statutes that govern the process by which substantive rights and duties are enforced in our federal and state courts. Topics include the relationship of procedure to substantive law, the proper reach of judicial authority, pleading, motions practice, joinder of parties and claims, class actions, pretrial discovery, trial by jury, remedies, post-trial procedure, appeals, claim and issue preclusion, and alternative dispute resolution. (Examination) (Academic year—day and evening)
- 220 **Legal Research and Writing (2)** Schultz and Staff  
Introduction to use of a law library; research experience in primary, secondary, and specialized sources of law; practice in proper legal citation form. Instruction and



practice in legal writing. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Fall—day and evening)

221 **Moot Court (1)**

Schultz and Staff

Instruction and experience in the writing and rewriting of an appellate court brief and in the argument of an appellate case. This course must be successfully completed in order to earn credit for Law 220. The grade *H* (Honors), *Cr* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Spring—day and evening)

222 **Professional Responsibility and Ethics (2)**

Jenkins, Nolan, Sharpe,

Johnston, Morgan, Peroni

Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth years. Ethical problems involved in civil and criminal counseling and litigation. Codes of Professional Responsibility and legal discipline; roles of bar associations and courts. (Examination) (Fall and spring)—day and evening; summer 1988)

232 **Evidence (4)**

Seidelson, Robinson, Kuhns

Preparation and presentation of evidence, including proof of writings; qualification and examination of witnesses with emphasis on impeachment; privilege; opinion testimony; determination of relevancy; demonstrative, experimental, scientific evidence; application of the hearsay rule. (Examination) (Spring—day and evening; summer 1988)

**ELECTIVE COURSES**

300 **Federal Jurisdiction (3)**

Barron, Raven-Hansen, Trangsrud,

Hoptman, Peterson

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law, procedural problems in exercising review, application of law to fact). (Examination) (Spring—day and evening)

302 **Trial Practice Court (2)**

Stevas, Barnes, Jamborsky,

Jackson, Levie, Sirulnik

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: 42 semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—evening)

303 **Mediation (2)**

Lewis, Singer

Consideration of the growing use of mediation to resolve disputes. Comparison of mediation with other forms of dispute resolution; applicability to various areas of the law, including family, criminal, environmental, and civil rights. Students participate in simulated disputes, both in and outside class, designed to familiarize them with the process of mediation and to raise a number of practical and ethical questions about its applications. Students keep short journal entries describing their experiences as mediators or disputants and write a 10–20 page paper either exploring a particular application of mediation or discussing legal or ethical questions involving mediation. Enrollment limited to 24. (Fall—day)

304 **Appellate Practice and Procedure (2)**

Study through text and an examination of the appellate process. The course is centered around the discussion of a series of fundamental concepts. (Research paper)

307 **Seminar: Administration of Criminal Justice (2)**

Robinson

Group study of current problems in criminal law and its administration, including recent developments in preventive detention, standards of effectiveness of defense



counsel representation, capital punishment, the permissibility, propriety, and efficacy of legal efforts to control life-style choices such as nonmarital sexuality, and related topics of interest to members of the seminar. Students will be expected to prepare one analytic paper and two critiques of papers of others. Enrollment limited. (Research paper)

**308 Advanced Civil Procedure: Complex Litigation (3)**

Trangsrud

Complex civil litigation in the federal courts, modern class actions, and the use of the injunction as a tool for institutional reform and the implementation of public policy. Emphasis on one or more of the following topics: modern injunction theory; alternative procedures for managing complex public and private litigation; the issues of representation, class conflicts, and judicial supervision of plaintiff and defendant class actions; the role of juries, magistrates, and masters in complex cases; government by injunction in free speech cases and in the reform of public schools, hospitals, and prisons; and the use of the contempt sanction. (Examination) (Fall—day)

**310 Seminar: Civil Procedure (2)**

Hoptman

Study of specific problems in civil procedure. Topics will vary. The topic will be announced each year prior to registration. (Research paper)

**311 Trial Advocacy (3)**

Jackson, Malone, L. Schwartz

Pretrial and trial techniques with emphasis on procedural, evidentiary, tactical, and ethical problems experienced by trial lawyers in actual cases. Complaint drafting, pretrial motions, depositions and other discovery methods, preparation of witnesses, jury selection, the use of experts, direct and cross-examination, introduction of documents, courtroom techniques, and opening and closing arguments. Role playing in simulated courtroom situations. Prerequisite: Law 232. (Short papers and exercises) (Fall—day and evening; spring—day and evening)

**312 Moot Court (1 or 2)**

Satisfactory participation in an upper-class appellate competition results in one hour of academic credit; finalists receive two hours of academic credit. Satisfactory participation in a trial-level, in-house competition results in one hour of academic credit; participants in interscholastic competitions receive two hours of academic credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

**314 Legal Writing (1 or 2)**

Staff

Preparation of a research paper under the supervision of a full-time member of the faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. See recommended guidelines under Regulations, Research Papers. (Research Paper) (Fall and spring—as arranged; summer)

**318 Seminar: American Legal History (2)**

Wilmarth

Philosophical and historical roots of the American Constitution, with consideration of the writings of Locke, Hobbes, and Montesquieu; the natural law and social contract theories; and the application of these concepts in the debates surrounding the drafting and ratification of the Constitution. The degree to which these concepts have been reflected in decisions of the Supreme Court, with primary focus on the Marshall Court but consideration also of more recent decisions. (Choice of Take-home Examination or Research Paper) (Spring—day)

**320 The Legal Process (3)**

Robinson, Levine

American legal institutions and their interrelationships and processes. Jurisprudential concepts in the context of specific problems commonly faced by private and governmental lawyers, legislators, courts, and administrative agencies. Issues of statutory interpretation, the roles of courts in making new law, and the allocation of functions between courts, administrative agencies, legislatures, and private decision makers. (Examination)



- 322 **Agency and Partnerships (2)** Sharpe, Schiller  
Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; nonprofit associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening)
- 324 **Law and Accounting (2)** Cibinic, Taubman  
Study of fundamental accounting principles with emphasis on corporation accounting; legal and accounting implications of specific items in financial statements of corporations; inventory adjustments; corporate transactions, distributions, capital adjustments. Strongly recommended for students who have had no accounting. (Examination and Problem Assignments) (Fall—evening)
- 325 **Corporations (4)** Green, Solomon, Wilmarth, Painter, Stout  
Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening; spring—day)
- 326 **Securities Regulation (3)** Green, Stout, Painter  
The basic course in the study of federal and state laws governing the offering, distribution, and trading of securities. Focus on federal laws and regulations, in particular the Securities Act of 1933, the Securities Exchange Act of 1934, and the enforcement of these laws by the SEC and private parties. Prerequisite: Law 325. (Examination) (Fall—day; spring—evening)
- 327 **Takeovers and Tender Offers (2)** Stout  
Federal and state regulation of corporate takeover bids and tender offers, including theories of corporate acquisitions, the Williams Act, and regulation of takeover tactics and defenses. Prerequisite: Law 325 and 326. (Research Paper)
- 328 **Regulation of Securities Markets and Professionals (2)** Painter  
Federal regulation of securities markets and professionals, including regulation of exchanges, broker-dealers and investment advisers, internationalization of markets, and SEC administrative proceedings against broker-dealers and others. Prerequisite: Law 325. (Take-home examination)
- 329 **Corporate Finance (2 or 3)**  
General introduction to finance theory; problems in the issuance and reacquisition of corporate securities; analysis of various types of securities; problems involved in the use of debt and payment of corporate dividends; and financial analysis of mergers, acquisitions, recapitalizations, dissolutions, and liquidations. Prerequisite: Law 325. (Examination)
- 332 **Banking Law I (3)** Wilmarth  
Federal regulation of the financial services industry, especially commercial banks. Includes an analysis of the Federal Deposit Insurance Corporation as insurer of deposits, receiver, and liquidator of troubled banks; the role of the Comptroller of the Currency as the primary federal regulator of national banks, including the chartering function, bank examinations, analysis of classified loans, capital adequacy, and enforcement of substantive federal legislation; operation of the Federal Reserve System under the Bank Holding Company Act and the various substantive regulations such as Reg. B (equal credit opportunity), Reg. J (check collection), Reg. M (consumer leasing), Reg. Q (deposit rate regulation), Reg. O (insider loan limits), Reg. E (electronic funds transfer), and Reg. Z (truth in lending); geographic deregulation and the trend toward interstate banking; and an analysis of financial services product deregulation and unification of the industry along functional lines. (Examination) (Spring—day)
- 333 **Banking Law II (2)** Clark  
Bank holding companies; activities closely related to banking under FRB Regulation Y; outer limits of the business of banking; banks, bank holding companies, and the securities laws; savings and loan holding companies; Change in Bank Control Act; the



FDIC and the troubled bank; bank liquidation and purchase and assumption arrangements; federal deposit insurance; the FDIC as receiver of a failed bank; international banking, including foreign banks in the United States, U.S. banks abroad, and foreign bank regulation of American banks abroad. (Examination)

**334 Business**

**Planning (2)**

Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock purchases in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 325 and 420. Berkeley, Press—prerequisite: Law 424; Flyer, Cirulnick—prerequisite or concurrent registration: Law 424. Enrollment may be limited by the professor. Berkeley, Green, Press, Flyer, Cirulnick, Painter—(Problem Assignments); Block, Cohen, Kirby—(Examination) (Fall—day and evening; spring—evening)

**336 Seminar: The Modern Corporation (2)**

Analysis of the nature and role of the business corporation in the American and transnational political economy; evolution of the corporation and the political economy; impact of technological change on the corporation and the political economy; reasons for and consequences of the growth of large corporate enterprises; role of entrepreneurs in the political economy; relationship of corporations to the government and other centers of power. (Research Paper) (Fall—day)

**337 Seminar in Advanced Corporations and Securities Topics (2)**

Current issues in corporate and securities law practice and theory. Prerequisite: Law 325. (Research Paper)

**338 Labor Law (3)**

Law governing labor-management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—evening; spring—day)

**340 Collective Bargaining and Labor Arbitration (3)**

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 338. (Problem Assignments) (Spring—day)

**341 Seminar: Labor Law (2)**

Group study of contemporary problems of labor law. Prerequisite: Law 338. (Research Paper)

**342 Administrative Law (3)**

Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Park and Banzhaf—(Examination) (Fall—day; spring—day and evening)

**344 Administrative Law Seminar (2)**

Group study of specific problems in administrative law. Topics will vary. In the fall semester, the course will focus on the Executive Branch. Prerequisite: Law 342. (Research Paper)

**345 Regulated Industries (2)**

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review.



Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper) (Spring—day)

- 347 **Seminar: Law of Congress and the Presidency (2)** Dienes, Raven-Hansen

A seminar study of the law governing the powers and relations of Congress and the Presidency and attendant separation of powers questions, including executive confidentiality and the congressional need for information, the President's legislative role, presidential accountability, executive law enforcement, supervision within the executive branch, executive appointments and removals, the President's supervision of foreign policy, and the constitutional allocation of war powers. Intensive preparation is required, and students are expected to prepare and present one analytic paper and two critiques of papers by others. Enrollment limited. (Research Paper)

- 350 **Seminar: Constitutional Law (2)** Peterson, Weicker

Group study of contemporary problems in constitutional law; process of constitutional litigation; problems of effectuating constitutional guarantees. Limited enrollment. (Research Paper or Examination) (Fall—day)

- 352 **Public Policy and Mass Media (2)** Barron, Dienes

Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. (Examination or Research Paper) (Fall—day and evening)

- 358 **Individual Rights and Liberties (3)** Dienes, Park

Principles of equality and due process in the Fifth and Fourteenth Amendments. The power of Congress to enforce the Fourteenth Amendment. Focus on individual rights and liberties under the U.S. Constitution. First Amendment rights, particularly religion and speech clauses. The right of association. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. Park (Examination); Dienes (Research Paper or Examination)

- 359 **Civil Rights Legislation (3)** Dienes

Examination of federal legislation protecting individual rights and liberties as well as the administrative and judicial implementation of that legislation. Remedial provisions for the enforcement of federal constitutional and statutory rights (e.g., 42 U.S.C. §§1983, 1985) and federal statutes prohibiting discrimination in housing, contractual relations, voting, education, and federally funded programs. (Examination) (Spring—day)

- 360 **Immigration Law (2)** Grussendorf

Law and practice under the McCarran-Walter Act, involving questions of immigration, emigration, expatriation, nationality, and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—evening)

- 362 **Legislation (2)** Clark, Raven-Hansen

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

- 364 **Current Decisions (1 or 2 per semester)** Staff

Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade CR (Credit) or NC (No Credit) is given for this course. (Fall and spring—day and evening)

- 366 **Journal of International Law and Economics (1 or 2 per semester)** Staff

Limited to members of the student staff of the *Journal of International Law and Economics*. A maximum of 4 semester hours of credit may be earned in this course.



- The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)
- 368 Research and Writing Fellow (1 or 2)** Schultz  
Limited to students selected as Dean's Fellows to assist in teaching first-year Legal Research and Writing (Law 220) and Moot Court (Law 221). Two semester hours may be earned in the fall and one semester hour in the spring. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)
- 370 Sales and Sales Financing (2)** Zubrow, Clark, Prince  
Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day; spring—evening)
- 372 Commercial Paper, Check Collection, and Banking (2)** Zubrow, Clark Spanogle  
Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Fall—day and evening)
- 378 Creditors' and Debtors' Rights (3)** Zubrow  
Creditors' remedies and debtors' protections under state law: writs of attachment, garnishment and execution, acquisition of liens and forced sales of property, self-help arrangements, and security agreements. Bankruptcy under federal law: who may file, the creation and administration of the bankruptcy estate, powers of the trustee, discharge of debt; rehabilitation plans for individuals under Chapter 13. (Examination) (Spring—day and evening)
- 380 Remedies (3)** Trangsrud, Sharpe, Pock  
Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial approaches include compensatory and punitive damages, injunctions, unjust enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. Cibinic, Sharpe—(Examination); Nash—(Problem Assignments) (Fall—evening)
- 382 Insurance (2)** Schiller, Pock  
A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Insurance marketing, insurable interest, subrogation, transfer of insurance benefits to non-policyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—evening)
- 386 Admiralty (3)** Sharpe  
United States law of transportation by water (vessels, cargoes, services, and persons). Substantive maritime law; procedures of resolving maritime disputes by litigation, arbitration, and administration. Legal aspects of processes such as planning shipping transactions; anticipating disputes through contract, statute, and treaty; creating and amending national and international shipping law; adjusting conflicts between courts and advancing toward a uniform maritime law. (Examination)
- 390-91 Trusts and Estates** Chandler, Solomon, Johnston, Tremper, Ridder  
I-II (3-3)  
Noncommercial transfers of wealth at death or during life. Law 390: essential elements and formalities for creation of trusts and execution of wills, revocation and alteration. Law 391: dispositive provisions, common questions of construction, future interests problems, administration of estates and trusts, charitable trusts. Prerequisite to Law 390: Law 211; to Law 391: Law 390. (Examination and Problem Assignments) (Law 390: fall—day and evening; spring—day)



394 **Community Property/Marital Property (2)**

Ridder

Legal rules and planning considerations with respect to property owned and acquired by married persons. Primary emphasis will be on the law of the eight community property states, but special attention will also be given to the parallel problems seen under the now widely enacted statutes creating judicial power to decree an equitable distribution of a divorcing couple's marital property. As time permits, federal tax rules and considerations will also be discussed. (Research Paper or Examination) (Fall—day)

395 **Seminar: Estate Planning (2 or 3)**

Solomon, Blake

Study of the effective disposition of wealth by inter vivos gift and testamentary transfer; emphasis on income, estate, and gift tax considerations; use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan; planning for the continuation or disposition of the client's business interests. Preparation of an estate plan with supporting documents is the major project for the course. Prerequisite: Law 390, 391, 420, and 422. Enrollment limited by the instructors.

Solomon—(Problem Assignments); Blake—(Examination) (Fall—evening)

398 **Modern Real Estate Transactions (3)**

Brown, Schiller

Basic course in conveyancing. Current problems in purchase and sale of residential real estate; legal and equitable rights, responsibilities, liabilities, and remedies of buyer, seller, broker, escrow agent, conveyancing attorney, surveyor, title examiner, abstractor, and lender; interim and permanent mortgage finance, discounts, points, "subject-to" and "assumptions," remedies on default, including foreclosure processes; process of examination and assurance of title and other interests in realty, including recording, registration, and title insurance systems; settlements and closings, warranties of title, habitability and structural integrity; risk-of-loss problems, property/casualty insurance; use restrictions, encumbrances on title, and clearing of title; problems related to encroachments, easements, adverse possession, and compliance with subdivision, zoning, building, and housing code regulations; emerging problems related to cooperatives, condominiums, and property owners associations. (Examination) (Spring—day)

402 **Planning, Zoning, and Land Use Law (2)**

Feola, Gordon

Problems, solutions, emerging concepts, and constitutionality of land use regulations, including zoning, subdivisions, historic preservation, exactions, vested rights, transfer of development rights, growth management, and urban and regional planning. This course provides the foundation for Law 403, 404, and 408. (Writing Assignments and Examination) (Spring—evening)

403 **Seminar: Current Problems in**

Brown, Schiller

**Land Use Management and Control (2)**

The constitutional "taking" issue: assessment of emerging mechanisms, processes, and institutional innovations for exercising public and private management and control of land use; consideration of regional regulatory standards for land use as a desirable or necessary alternative to local controls and of the prospect that such process will satisfy the *Nollan* "nexus" requirement; critical analysis of TDRs, linkage and other off-site exactions, impact fees, proffers, etc.; problems of affordable housing and available responses. Students may participate in microsimulation activities. (Research Paper) (Spring—day)

404 **Land Use Administrative Process (2)**

Delaney, Kominers

Selected problems in urban development and housing, with particular emphasis on programs under current enabling legislation and federal and state court decisions. Analysis of various public and private decision processes through which conflicts over land use are resolved. Simulation of a complex zoning hearing. Prerequisite: Law 402 or permission of instructor. (Writing Assignments) (Fall—evening)

408 **Land Development Law (4)**

Brown

(Simulation course)

Students participate in a semester-long simulation process encompassing 42 months of "game time." As junior associates in various hypothetical law firms or offices, students represent their assigned clients, with all interactions based on actual situations and often incorporating recent or ongoing cases of major significance. All levels



of judicial, administrative, and legislative activity are involved. Enrollment limited by instructor. (Writing Assignments) (Fall—day)

**409 Local Government Law (2)**

Decision-making processes in metropolitan and other municipal-level governments; types and objectives of city, county, and special-function local government units; intra- and intergovernmental relations; initial organization and changes in form and function of local governments; personnel matters; local legislative and administrative authority and processes; financial processes; governmental vs. proprietary functions; responsibility in tort; insurance issues; introduction to community planning; extraterritorial powers; joint-power agreements and compacts. (Examination or Research Paper) (Fall—day)

Brown

**410 Environmental Law (3)**

An introductory course focusing primarily on the statutes administered by the Environmental Protection Agency. Topics covered include NEPA, toxic and hazardous substance control, and radiation. (Examination) (Fall—day)

Reitze

**411 Air Pollution Control (3)**

An in-depth analysis of the Clean Air Act, focusing on legal problems common to environmental law. Topics covered include standard setting, technology-based controls, development of pollution control plans, monitoring, inspection, enforcement, economic controls, energy trade-offs. (Examination) (Spring—day)

Reitze

**414 Clinical Studies in Environmental Law (2, 3, or 4)**

The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency, a Congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to the course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 410. Students may repeat the course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Five hours of work per week are required for each credit. (Fall and spring—day)

Reitze

**415 Occupational Safety and Health Legislation (2)**

The Occupational Safety and Health Act of 1970 and related legislation. (Examination) (Fall—evening)

Michaelson

**420 Taxation—Federal Income (3)**

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. (Examination) (Fall—day and evening)

Solomon, Sims, Block, Peroni

**422 Taxation—Federal Estate and Gift (2)**

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction, and split gifts; tax procedure. (Examination) (Spring—day)

Solomon

**424 Taxation—Federal Income, Corporations and Shareholders (3)**

Continuation of Law 420. Primary emphasis on corporate-shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind. Federal income tax problems involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Prerequisite: Law 420. (Examination) (Fall—evening; spring—day)

Solomon, Sims, Block, Painter

**426 Taxation—Partnerships and Subchapter S (2)**

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Practice-oriented study of partnerships, including syndication, organization, and structure of entity, with emphasis on policy

Sanders, Block



examination of areas of IRS principal concern, including tax shelters, disproportionate tax allocations, retroactive allocations, guaranteed payments to partners, contributions of capital, basis for gain or loss, non-recourse financing, "at-risk" rules, current and liquidating distributions, sale of partnership interests, collapsible partnerships, "like-kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including procedures for electing and terminating Subchapter S status, treatment of income and losses, limitations on deductibility of losses, and how to avoid pitfalls. (Examination) (Spring—evening)

428 **Seminar: Special Problems of Tax Policy (2)**

Sims, Block

Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 420, 424. (Research Paper)

434 **Domestic Relations (2)**

Tremper

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Spring—day and evening)

437 **Seminar: Law and Psychiatry (2)**

Designed to expose the lawyer to basic constructs of psychiatry and psychology and to explore their implications in legal rules and practice. Psychiatrists and psychologists actively involved in teaching process. Topics include psychological testing and other assessment techniques, psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross-examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Choice of Research Paper or Examination)

438 **Comparative Law (3)**

Brand

Comparison of the world's major legal systems: civil, common, Islamic, and socialist. Consideration of the history and sources of law of each and a review, concentrating on the civil law system, of hallmark institutions, the role of lawyers, procedure, and selected substantive legal issues. Emphasis on issues and problems of the international lawyer, including conflicts among and harmonization of the legal systems, the migration of legal ideas, and pleading and proving foreign law. (Research Paper or Examination) (Spring—day)

440 **Conflict of Laws (3)**

Seidelson, Pock, Steinhart

Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of estates, business associations. (Examination) (Fall—evening; spring—day)

442 **Jurisprudence (2)**

Park, Chandler, Steinhart

Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. Park, Steinhart—(Examination); Chandler—(Research Paper) (Fall—evening; spring—day)

443 **Foreign Relations, National Security, and the Constitution (2)**

Raven-Hansen

An examination of problems of constitutional and other public law that arise in the development and conduct of U.S. foreign relations, including the distribution of political power among the three branches of government in matters of foreign affairs (including treaty negotiation, observance, and termination; war powers; national security); the role of the judiciary in interpreting and applying international law and/



- or resolving disputes arising out of the foreign relations of the United States; individual rights and foreign affairs; the impact of federalism; and related topics. Prerequisite: Law 444. (Examination or Research Paper) (Spring—day)
- 444 International Law (3)** Steinhardt, Buergenthal  
An introduction to international law that provides the background for specialized seminars. Emphasis on national states as participants in decision-making processes, with consideration of public bodies and other participants; analysis of range of available sanctions; roles and effects of international agreements under the U.S. Constitution; introductory study of humanitarian law; introductory study of the World Bank. Complements but does not repeat material in Law 447. (Examination) (Fall—day and evening; spring—day)
- 446 International Business Transactions (3)** Steinhardt, Spanogle  
U.S. law and practice relating to characteristic forms of international transactions, including the transnational sale of goods (the law governing the documentary sale, various forms of letters of credit, commercial terms and insurance); the export of technology through franchising, distributorship, and licensing contracts; and the export of capital through the establishment, operation, and withdrawal of foreign direct investment. The impact of relevant international organizations and/or emerging substantive international commercial law (e.g., the United Nations Convention on Contracts for the International Sale of Goods and other treaties on international negotiable instruments, international lease financing, and international factoring). Specialized problems in the negotiation and drafting of international contracts. (Examination or Research Paper) (Fall—day; spring—evening)
- 447 International Organizations (2)** Alvarez  
Analysis of characteristic legal issues arising out of the creation and operation of organizations of nation states. Included are issues of legal personality, treaty making and norm creation, privileges and immunities, membership, dispute settlement, and withdrawal. Exemplary problems in distinct institutional settings, including the United Nations, the International Labour Organization, the International Civil Aviation Organization, the Organization of Economic Cooperation and Development, the International Monetary Fund, and inter-American organizations. Prerequisite or concurrent registration: Law 444; for post-J.D. students, permission of instructor may be substituted. (Examination or Research Paper) (Fall—day)
- 448 International Arbitration (2)**  
Survey of arbitration and related mechanisms of dispute resolution in the international legal system that arise out of commercial, financial, and governmental transactions. Analysis of the arbitration agreement, the process of arbitration, and the enforcement of arbitral awards as well as the common principles governing the disposition of claims. Review of the various arbitral tribunals and their rules. Prerequisite or concurrent registration: Law 444 or 446; for post-J.D. students, permission of instructor may be substituted. (Research Paper or Examination)
- 449 International Civil Litigation (2)**  
Analysis of the law relevant to the trial of cases having international elements in U.S. domestic courts, including the problems of establishing jurisdiction over foreign defendants, obtaining transnational discovery and service of process, enforcing foreign judgments, drafting and defending choice of forum and choice of law clauses, determining the extraterritorial reach of U.S. law, proving foreign law, and assessing the role of U.S. courts in deciding cases with potential consequences for U.S. foreign relations. Analysis of the impact of international issues on actual litigation as well as the initial structuring of a transaction in light of the client's potential litigation interests. Prerequisite or concurrent registration: Law 444; for post-J.D. students, permission of instructor may be substituted. (Examination or Research Paper)
- 450 Unfair Trade Practices (3)** Banzhaf, Schechter  
Unfair trade practices at common law and under modern legislation; privilege to enter markets and compete; interference with contractual relationships; trademarks and trade names; imitation of product appearance; misappropriation of ideas and trade secrets; right of publicity; basic copyright principles; protection of competitors and consumers against false advertising and unfair or deceptive practices under the



Federal Trade Commission Act, the Trademark Act, and state unfair trade and consumer protection statutes; price and service discrimination under the Robinson-Patman Act and state legislation. (Examination) (Spring—day and evening)

452 **Federal Antitrust Laws (3)**

Schechter, Morgan

Federal antitrust law and policy under the Sherman, Clayton, and FTC Acts; basic economic theory of free-market operation; the Rule of Reason and *per se* offenses; price fixing, market division and related agreements under Sherman Act §1; conspiracies; boycotts; trade association activities; measurement of industrial concentration; monopolization and attempts to monopolize under Sherman Act §2; mergers and joint ventures under the Sherman and Clayton Acts; resale price maintenance and other vertical restraints; exclusive dealing and tie-in agreements under the Clayton and Sherman Acts; selected exemptions from antitrust liability. (Examination) (Fall—day and evening)

454 **Product Liability (2)**

T. Schwartz

Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—day)

455 **Toxic Tort Litigation (2)**

The use of common law remedies to compensate those injured by diseases characterized by long latency periods and, usually, relatively low levels of exposure. Insurance, workers compensation, and evidentiary issues. (Examination) (Spring—evening)

460 **Problems of the Consumer (arr.)**

Staff

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Consumer 9" is a project that solves problems received in writing or by telephone for a nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal programs allow students to gain experience in regulatory agencies. Students may also write and publish in the *Consumer Protection Reporting Service*. Minimum of eight hours work commitment each week; two-hour weekly seminars required in addition for 3 credits. May be repeated once for a total credit not to exceed 6 hours.

(2) *Bankruptcy Clinic*—Open to second- and third-year students. Students participate in negotiations with creditors, counsel clients in financial matters through intensive interviews, and prepare legal petitions in bankruptcy that may be necessary to assist clients. May be taken for 2 or 3 credits. One and one-half hour weekly seminar.

The grade CR (Credit) or NC (No Credit) is given for both sections of this course. (Fall, spring, and summer—day)

462 **Seminar: Trade Regulation (2)**

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper)

464 **Patent Law (2)**

Banner

Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, utility and enablement; infringement, doctrine of equivalents, and file-wrapper estoppel. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

466 **Patent Office Practice (2)**

Lipsey

Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before the U.S. Patent Office. Obtaining and preserving earliest



- possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 464. (Examination) (Spring—evening)
- 468 Computers and the Law (3)** Chandler  
A critical study of selected major legal problems presented by computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) Park
- 469 Seminar: Law of Privacy (2)** Park  
A review of the law of privacy as it has developed in constitutional litigation, tort law, and state and federal statutes. Current developments and rationales for further expansions of privacy rights are considered. (Research Paper)
- 470 Medicine for Lawyers (2)**  
Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination) Michaelson
- 472 Law and Medicine (2)** Michaelson  
Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Spring—evening) Sirulnik, Meyers
- 474 Seminar: Drugs and the Law (2)** Sirulnik, Meyers  
A study of federal and state laws controlling illicit drugs, including the historical evolution of these laws, current offenses and penalties, constitutional limits on the criminal sanction, enforcement practices, and sentencing considerations. Alternative models for controlling drugs, including decriminalization and legalization. Five class sessions will be devoted to mock criminal trials at which student teams conduct direct and cross-examination of guest expert witnesses in the field. Graded on the basis of assigned memoranda pertaining to the legal issues involved in the mock hearings. (Writing Assignments) (Spring—day) Green
- 475 Seminar: Law, Science, and Technology (2)** Green  
Reciprocal relationships between law and science; absorption of scientific concepts into substantive law through adjudication, legislation, and rule-making techniques and procedures used in handling, developing, and deciding scientific issues. (Research Paper) Courtless
- 478 Law and Criminology I: Search for the Causes of Criminal Behavior (2)** Courtless  
The role that criminological knowledge of crime causation may play in assisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such causal theories. (Research Paper) (Fall—day) Courtless
- 479 Law and Criminology II: Society's Responses to the Criminal Offender (2)** Courtless  
Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's



changing responses to criminal and delinquent behavior; research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 478. (Research Paper) (Spring—day)

480 **The Police and the Community (2)**

Courtless

Problems and potential of contemporary urban law enforcement; the role and perspective of the police officer; the police *qua* organization; styles of law enforcement; law enforcement in the inner city; relationship with ethnic minorities; civil disorder; police-community relations; methods in arrest and investigation; complaint review procedures; science and technology in law enforcement; police handling of juveniles; crime and crime statistics. (Problem Assignments)

482 **Disabled People and the Law (2)**

Banzhaf

Examination of those areas in which persons with disabilities have traditionally been denied some right or benefit afforded other persons in our society and have resorted to legal action; introduction to statutes and agencies designed to protect people with disabilities. Students may choose to prepare a research paper (and receive legal writing credit and a numerical grade) or to gain practical experience doing a clinical project (on a *CR/NC* basis). (Spring—day)

483 **National Center for Law and the Deaf**

Banzhaf

**Clinical Education Activities (1, 2, or 3)**

Work with the National Center for Law and the Deaf in bringing legal information, services, and representation to the more than 13 million Americans who are deaf or hearing-impaired. The Center is designed to help make the hearing-impaired aware of their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing-impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to law and the deaf or preparing handbooks explaining legal topics to the hearing-impaired. Students may learn some sign language but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester is required for each credit hour. Students may repeat this course for a maximum of 8 semester hours of credit. This course may not be taken at the same time as Law 495 or any litigating activities in Law 493. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

484 **Women and the Law (2)**

Ridder

An examination of the treatment of women in all areas of the law and legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. (Research Paper) (Fall—day)

486 **Government Contracts (3)**

Nash, Eliasof

Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 487 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—day)

487 **Government Procurement Law (4)**

Cibinic, Lees

Survey of the law pertaining to government procurement, including an analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. The course focuses on the contract formation process, including techniques for awarding contracts and litigation and protests involving awards. Law 486 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—evening)



- 488 **Performance of Government Contracts (4)** Nash, Cibinic, Lees  
Discussion of the substantive problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses; analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. Analysis of the methods that can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. Law 489 is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—evening)
- 489 **Administration of Government Contracts (3)** Cibinic, Eliasof  
Interpretation of contracts and the legal principles governing the risk allocation between the contracting parties. Contractor claims against the government for changes, differing site conditions and delays. Government enforcement of its contract rights for timely performance of work complying with the specifications. Terminations for default and the convenience of the government. Procedures for litigating disputes between the parties. Law 488 is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)
- 490 **Seminar: Government Contracts (2)** Cibinic, Nash, Lees  
Research and discussion of selected problem areas. (Research Paper) (Spring—day)
- 491 **Government Contracts Cost and Pricing (2)** Cibinic, Nash  
Legal aspects of government contract accounting principles and allowability of costs. Cost accounting standards and cost allocation issues. Negotiation of cost, profit, and price. Disclosure of cost accounting data. (Problem assignments) (Fall—evening)
- 492 **Clinical Law Work (arr.)** Staff  
Projects involving litigation, research, or public interest activities of a legal nature (including aid to indigents, support of public interest nonprofit corporations, and support of governmental agencies or courts) may be initiated and will be supervised by a faculty member. Projects must be approved in advance by the Law Center Supervisory Committee (three members) both as to whether the project is appropriate and as to the number of semester hours of credit to be granted. A maximum of 10 semester hours of credit may be taken in one or two semesters. This course is open to a limited number of third-year law students. The grade CR (Credit) or NC (No Credit) is given for this course. (Fall and spring)
- 493 **Legal Aid (arr.)** Sirulnik and Staff  
(1) *Civil Administrative Law Clinic*—Working under the supervision of staff attorneys, students represent indigent litigants before state and federal administrative agencies. Activities include Social Security Disability hearings, Rental Accommodations Office hearings, Unemployment and Workers' Compensation hearings, food stamp reviews, will writing, and other public benefits program work. Ten hours of work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration. (Del Giudice, Sullivan)  
(2) *Immigration Clinic*—Clinical work includes representation of clients at deportation hearings, and oral argument before the Immigration and Naturalization Service, Board of Immigration Appeals, and the U.S. Court of Appeals. Students will assist aliens residing in the Washington area with a wide variety of problems, including adjustment from nonimmigrant to immigrant status, obtaining labor certifications and work visas, obtaining visas for their relatives in other countries to enter the United States, and obtaining voluntary departure orders for those whose visas have expired and who are threatened with deportation. Ten hours of work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration. Prerequisite or concurrent registration: Law 360. (Grussendorf)  
(3) *Outside Clinical Placement*—Students arrange independent projects with state or federal public interest organizations for academic credit. A compilation of suggested projects is available within the Community Legal Clinics office. Projects must receive prior approval by the Director of Clinical Programs or the staff. (Sullivan)  
(4) *Small Business Clinic*—Under guidance of the instructor, students assist small businesses and nonprofit organizations, dealing with a wide variety of problems.



including drafting partnership and incorporation papers, drafting and reviewing contracts and commercial leases, advising on tax problems, and resolving disputes. Fifteen hours of work per week required. Prerequisite: Law 327 and 420. Permission of the instructor required prior to registration. (Jones)

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of this course. (Fall, spring, summer)

#### 495 **Law Students in Court (4)**

Carter

A clinical program in trial advocacy, offering an opportunity to develop skills as a trial lawyer while representing indigent persons in the Superior Court of the District of Columbia. Students may participate in either the civil division (which focuses primarily upon the representation of tenants in landlord-tenant actions, but also handles some consumer, negligence, and other civil matters) or the criminal division (in which student litigators defend persons charged with misdemeanor offenses). Students in both divisions have the opportunity for jury trials. They are responsible for all aspects of litigation under the supervision of clinical instructors: interviewing clients and witnesses, conducting investigations, preparing pleadings, engaging in settlement negotiations or plea bargaining, and conducting all motions hearings and trials pursuant to the Superior Court's third-year practice rule. Only third-year students who have completed Law 218, 215, and 232 may participate in the clinic. Seminars are held in the civil division on Monday evenings and in the criminal division on Wednesday evenings. Students must have one day per week available for court appearances and plan to devote approximately 20 hours per week to the clinic. Students must participate in the program for two consecutive semesters, beginning in either the summer or fall. Application must be made during the spring semester of the preceding academic year. This course may not be taken at the same time as Law 497 or any litigating activities in Law 493. Enrollment is limited, with selection by lottery. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, and summer)

#### 496 **Law Students Civil Rights Research**

Sirulnik and Staff

##### **Council (LSCRRC) (2, 3, or 4)**

Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester are required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Permission of the instructor is required prior to registration. (Fall, spring, summer)

#### 497 **Clinical Studies in Urban Law (arr.)**

Sirulnik and Staff

(1) *Civil Litigation Clinic*—Open to third-year students. Students represent indigent litigants in the Small Claims, Family, Landlord-Tenant, and Civil Divisions of the D.C. Superior Court. Work responsibilities include client interviewing, investigation, settlement negotiations, preparation and argument of motions, as well as conducting actual trials. Two-hour weekly seminar. (Strand, Barthel)

(2) *Federal Appellate Clinic*—Open to third-year students. Students participate in preparing actual cases on appeal, starting with review of trial transcript and culminating with preparation of brief and oral argument before the U.S. Court of Appeals for the District of Columbia Circuit. Appellate practice and procedure studied through texts; consultation with appellate judges, law clerks, and attorneys with cases pending on appeal; observation of arguments in the Supreme Court and the Court of Appeals. Two-hour weekly seminar. (Del Giudice)

(3) *Consumer Litigation Clinic*—Open to third-year students. Students represent indigent consumers in the Small Claims and Civil Divisions of the D.C. Superior Court and U.S. District Court and represent consumers in administrative proceedings before the D.C. Department of Consumer and Regulatory Affairs. Students assume full case responsibility from the initial interview through trial. Two-hour weekly seminar. (Izumi)

For all sections, admission is by permission of instructor; students must submit applications during spring term of preceding year. Must be taken for 4 credit hours per



term for the entire academic year or for 2 credit hours carried over both summer sessions. (Fall, spring, summer)

**498 Legal Activism (2 or 3)**

Study of the legal process, not to benefit individual clients, but as a powerful tool for affecting social change and advancing the public interest. Topics discussed in a two-hour seminar meeting each week include principles of maximizing legal leverage, legal judo, guerrilla law, working with the press and members of Congress, drafting of legal documents, unusual legal tools and tactics, negotiation, making money from public interest law, etc. Students may choose to bring a public interest legal action before an agency or in court or may undertake another legal action project for 3 credits and receive a numerical grade. Alternatively, students may do research on a topic related to public interest law for 2 credits on a CR/NC basis. (Fall—day)

**500 Practical Economics for Lawyers (2)**

For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost/benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination) (Spring—evening)

**501 Public Economic Policy and the Law (2)**

Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

**502 Law and Economics (2)**

Theoretical applications of economic analysis in the study of legal problems and legal institutions. Social welfare theory and basic microeconomic theory are used to explore the common law. For students with no previous economic training. (Examination) (Spring—day)

**503 Statistics and the Law (2)**

Case method approach to using statistical analysis in proving legal issues. Employment discrimination, civil rights, and regulatory law cases are considered. For students who are afraid of numbers. (Examination)

**504 Seminar: Advanced Problems in Public International Law (2)**

Group study of contemporary problems in the theory and practice of international law. Limited enrollment. Prerequisite: Law 444 or permission of instructor. (Research Paper or Examination)

**505 International and U.S. Regulation of Foreign Trade (2)**

Study of domestic and international laws and institutions governing foreign trade. Included are the legal consequences of U.S. participation in the GATT, UNCTAD, and other international forums; laws regulating customs and tariffs, government procurement, subsidies, dumping, unfair foreign trade practices, disruptive imports under the escape clause, East-West trade, the generalized system of preferences, most-favored nation treatment, exports under the Export Administration Act, and foreign assets control; the impact of Friendship, Commerce, and Navigation treaties. Specialized problems in regulating boycotts, foreign corrupt practices, and restrictive business practices. Prerequisite or concurrent registration: Law 446; permission of instructor may be substituted. (Examination or Research Paper) (Spring—evening)

**506 Seminar: Advanced Problems in International Business Transactions (2)**

Group study of contemporary problems in international business law and practice. Limited enrollment. Prerequisite: Law 446 or permission of instructor. (Research Paper or Examination)

**507 Regulation of Investment Advisers and Investment Companies (2)**

Applicability of the Investment Company Act of 1940 to particular business activities that may bring an entity within the statutory definition of investment company; litigation as to fees; policy considerations relating to front-end loads; SEC regulations regarding advertising and promotion; restrictions on activities by affiliates; and cur-



rent SEC disclosure requirements. Applicability of the Investment Advisers Act of 1940 to activities of individuals and entities; procedures for compliance; First Amendment issues raised by SEC enforcement actions; and civil liability under the antifraud provisions of the securities laws. (Examination)

508 **Seminar: Health Care Delivery Systems (2)**

Tillman

Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements; examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper) (Spring—evening)

509 **Food and Drug Law (2)**

Kaplan, Becker

The Federal Food, Drug, and Cosmetic Act and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

510 **Administrative Practices and Procedures (Food and Drug Administration) (2)**

The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency practices and procedures, and problems designed to enable the practical application of rulemaking and hearing procedures to achieve resolution. Prerequisite: Law 342. (Examination)

Ginsburg, Abrahams

520 **Labor Standards (2)**

Analysis of the Fair Labor Standards Act, its scope and exemptions, debarment and suspensions; the laws establishing labor standards for government contracts, including the Davis-Bacon Act, Walsh-Healey Act, Service Contract Act, and Work Hours Act; the role of the Department of Labor, the Comptroller General, and the contracting agencies in interpretation, administration, and enforcement of these statutes. (Examination) (Spring—evening)

521 **Labor Relations in the Federal Service (2)**

Tobias

Study of the Civil Service Reform Act, with emphasis on the structure and case law developed by the Federal Labor Relations Authority, Federal Service Impasses Panel, and Merit Systems Protection Board. Parallels are drawn between federal sector, non-federal public sector, and private sector decisions. (Research Paper) (Fall—evening)

Osborne, Witlen

522 **Internal Union Affairs (2)**

Study of the legal relations between unions and their members with special emphasis on the right to fair representation, the right to union membership, compulsory union membership, the imposition of discipline upon union members, reporting requirements, the conduct of internal union elections, the fiduciary duties of union officers, the imposition of trusteeships, the regulation of racketeering, and political action of unions. Prerequisite: Law 338. (Examination)

524 **Equal Employment Opportunity (2)**

Morris, Craver

This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act; Executive Orders 11246 and 11375 relating to government contractors (including the Philadelphia Plan and other government-imposed affirmative action plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). Substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening; spring—day)

526 **Seminar: Labor Litigation (2)**

Driesen

Review and analysis of the Supreme Court's role in the development of national labor policy, broadly conceived. The Court's current employment law docket, including cases arising under the National Labor Relations Act, the Civil Rights Laws, ERISA, and



statutes governing the rights of public employees. Brief review of Supreme Court practice and procedure. The role of selected institutions and the proclivities of the Justices in shaping the content and impact of the Court's efforts in the employment arena. Students are expected to prepare a paper and lead a class discussion analyzing the legal and jurisprudential issues presented in a pending Supreme Court case. Prerequisite: Law 338. (Research Paper)

**527 Equal Employment Claims and Litigation (2)**

Litigation in federal court of a claim of employment discrimination; problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings that the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Problem Assignments) (Spring—evening)

**529 Seminar: Public-Sector Labor Law (2)**

Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper)

**532 The Crime Lab, the Forensic Scientist, and the Criminal Lawyer (2)**

Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper or Examination at the discretion of the instructor) (Fall—evening; spring—day)

**534 Seminar: Criminal Practice (2)**

Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work are covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross-examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 305. Students may elect to receive either a numerical grade or the grade *CR* (Credit) or *NC* (No Credit).

**535 Law of Criminal Corrections (2)**

Study of two principal areas: sentencing procedures (including probation, parole, and imprisonment) and legal rights of prisoners. Enrollment limited to 25 students. (Examination) (Fall, even years—evening)

**538 Law of Real Estate Financing (2)**

Types of lenders, choice of entity, construction loans, permanent financing; lenders' obligations, remedies, and liabilities; title insurance, survey, and liens; ground lease and commercial lease/leasehold mortgage; joint ventures; alternate capital formation; opinion letters. (Examination) (Spring—evening)

**539 Survey of the Secondary Mortgage Market (2)**

Overview of the secondary mortgage market, including mortgage products, financing and operations of government-sponsored agencies, regulatory framework, mortgage mathematics and pricing, mortgage-backed securities, and derivatives and the private market. (Examination) (Fall—evening)

**541 Intergovernmental Relations I (2)**

Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state, and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper)



- 543 **Water Resources Law (2)** Wood  
Federal and state powers over water; riparian and prior appropriation doctrines. Federal permit programs and wetland protection. Environmental problems concerning water quantity. Recommended as an introductory course. (Examination) (Fall—evening)
- 544 **Environmental Planning (2)** Kussy  
Administrative law issues, the National Environmental Policy Act, historic preservation, parkland protection, coastal zone management, river basin and floodplain planning, comprehensive transportation planning, state environmental planning laws, mitigation requirements. (Examination) (Spring—evening)
- 545 **Regulation of Chemicals (FIFRA & TSCA) (2)** T. Johnston, Fleuchas  
Examination of environmental pesticide control: the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Toxic Substances Control Act (TSCA), and related legislation. (Examination) (Fall—evening)
- 546 **Natural Resources Law (2)** McBride  
Introduction to federal public lands and their multiple uses: forestry, grazing, water, mining, fish and wildlife, recreation, and preservation. Principles of Congressional and state authority over these lands. Endangered Species Act and wildlife refuges. The Wilderness Act and the National Park System. Class focus on topical case studies and statutory materials. Recommended as an introductory course. (Examination) (Fall—evening)
- 547 **Water Pollution Control (2)** Reitze  
Introduction to water pollution control: the Clean Water Act, the Safety of Public Water Systems Act, the Marine Protection, Research and Sanctuaries Act (Ocean Dumping Act). (Examination) (Fall—day)
- 548 **Control of Toxic and Hazardous Substances (RCRA & CERCLA) (2)** Friedman, Berry  
Analysis of the federal and state laws and regulatory schemes relating to the control of toxic and hazardous substances. The Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") are examined. (Research Paper) (Spring—evening)
- 549 **Energy (2)** Hollis  
Survey of federal regulation of the major energy industries. Emphasis on federal controls affecting the natural gas, coal, oil, synthetic fuel, and electric industries. The course approaches energy regulation from a statutory and case standpoint, and also deals with practical, procedural issues. Enrollment is limited to 35 students. Recommended for third-year students. (Examination) (Fall—evening)
- 550 **Use and Control of Nuclear Energy (2)** Malsch  
Analysis of the legal framework for regulation of nuclear energy in the United States and for dealing with proliferation of nuclear weapons abroad. Discussion of substantive technical and policy issues relating to nuclear power reactor safety, disposal of radioactive waste, and safeguarding nuclear installations against domestic nuclear terrorism. Focus of the legal discussion is on the U.S. Nuclear Regulatory Commission. Includes such topics as federal preemption, impact of the National Environmental Policy Act of 1969, conduct of adjudicatory hearings under the Administrative Procedure Act, compensation for injuries from nuclear accidents, and prelicensing anti-trust reviews. (Research Paper) (Fall—evening)
- 551 **Comparative Environmental Law (2)** Campbell  
Environmental law of the United States, foreign and domestic environmental law of Japan, and international environmental law of the European community. The course considers differences in implementation and enforcement of domestic environmental law under the federal system of government in the United States and the central system of government in Japan as well as differences in implementation and enforcement of domestic and international environmental law. In comparing domestic and international environmental laws, toxic substance and pesticide legislation in the United States, Japan, and the European community is covered. (Research Paper) (Spring—evening)



**552 Patent and Know-how Licensing (2)**

The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his or her status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 464. (Choice of Research Paper or Examination) (Spring, odd years—evening)

**553 Chemical Patent Practice (2)**

Seminar covering patent application preparation, prosecution, appeals, and interferences peculiar to chemical patent practice. Prerequisite: Law 464 and 466, or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

**554 Advanced Topics in Patent Law (2)**

Seminar directed to selected, advanced, and usually topical aspects of patent law. Topics may include the Re-examination Statute of 1981, procedure in patent infringement appeals to the U.S. Court of Appeals for the Federal Circuit, patent and copyright protection of living microorganism and genetically engineered sequences, fraud in patent practices, and advanced aspects of practice before the U.S. Patent and Trademark Office, including inter partes interference practice. This course may be repeated for credit. Prerequisite: Law 464 and 466. (Research Paper) (Spring—evening)

**555 Research in Patent, Trademark, and Copyright Law (2)**

Prerequisite: Law 464, 466, and related courses. Request in writing, with proposed outline of topic of research, must be submitted to the instructor at least one month prior to registration day. Work must be completed within the semester and paper submitted not later than the last day of classes. Graduate students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall and spring)

**558 International and Comparative Patent Law (2)**

Origin of patent laws. Patent systems of major countries—United Kingdom, France, Germany, USSR, and others. Comparative topical survey: kinds of patents, inventors and applicants, subject matter, novelty, administrative procedures, oppositions, revocation, renewal fees, compulsory licensing, infringement, etc. International Convention for the Protection of Industrial Property: origin, membership, organization, substantive provisions. Treaties in the making, Common Market patent system, Nordic Patent, Patent Cooperation Treaty. Council of Europe activities. Prerequisite: Law 464 and 466. (Examination) (Spring, even years—evening)

**559 Copyright Law (3)**

Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing and performing rights societies. (Examination) (Fall—evening)

**560 U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks (2)**

Procedural and substantive law on use, registration, and protection of trademarks, including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. (Examination) (Fall, odd years—evening)

**561 Law of the European Communities (2)**

Study of the European Communities' law-making structure and substantive doctrines of EC law (e.g., antitrust, insider trading, director liability, unionization, workers' rights, and transborder data flow). (Research Paper or Examination) (Spring—evening)



**562 Law of Japan (2)**

An introduction to the constitutional structure of Japan, including political institutions and the judicial system, the legal profession, criminal law, domestic relations, business organizations, commercial law, administrative regulation, taxation, dispute resolution, intellectual property, restrictive business practices, and trade. (Research Paper or Examination)

**563 Negotiation: Concepts and Techniques (2)**

Ramundo, Tankel, Craver

Roles of the attorney-negotiator and principal (client) in the private, intraorganizational, and international negotiating environments; the "think negotiation" mentality and a suggested conceptualized approach to the negotiation process, including the definition of negotiation, four phases of negotiation, and operational checklists; negotiating techniques, including presentational considerations and the use of persuasion, tactics and ploys, and classic do's and don'ts lists; theories of the opening position and concession-making. Practical exercises in the actual conducting of negotiations. Enrollment limited by the instructors. (Writing Assignments) (Spring—day and evening)

**564 Arms Control and Strategic Stability (2)**

Doyle

Legal aspects of arms control and strategic stability; nuclear technology, weapons and effects; delivery systems and strategic balance, including linkage to conventional forces; nuclear and arms control strategies; nuclear testing agreements; nonproliferation agreements and issues; SALT I and antiballistic missile agreements; SALT II evolution and issues; verification, compliance, risk reduction, and confidence building; current negotiations and issues (INF, START, ABM, NST, SDI, ASAT). (Research Paper)

**565 The International Law of Human Rights (2)**

Buergenthal

Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights: the individual vis-à-vis the state; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. Prerequisite or concurrent registration: Law 444; for Post-J.D. students, permission of instructor may be substituted. (Research Paper) (Fall—evening)

**566 International Law of Air and Space (2)**

Steinhardt, Smith

Study of the development of international law related to the use of air space and outer space; analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space; earth resources, sensing, etc. Enrollment limited to 25 students. Prerequisite or concurrent registration: Law 444; for Post-J.D. students, permission of instructor may be substituted. (Research Paper) (Spring—evening)

**567 International Law of the Sea (2)**

Doyle

International law related to the use of ocean space. Development of international law concerning internal waters, territorial sea, contiguous zone, high seas, continental shelf, fisheries, exclusive economic zone, maritime boundaries, marine environment, marine scientific research, deep seabed, and settlement of disputes. Current legal and policy issues associated with these areas. Prerequisite or concurrent registration: Law 444; for Post-J.D. students, permission of instructor may be substituted. (Examination) (Spring—evening)

**568 International Humanitarian Law of Coercion Control (2)**

Buergenthal

Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, the role of the International Committee of the Red Cross, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)



### 569 Soviet Law (2)

The concepts of socialist legality and socialist democracy and the class bias of the socialist modifier; the legal relationship between the individual and the state; the state as principal economic actor; the role of the Communist Party in Soviet society; the Party-State; the other actors in Soviet society; the Soviet theory of state and law; state (constitutional) law; socialist federalism; the governmental and Party structures; individual rights and obligations; criminal law; property law; labor law; law of civil legal obligations; family law; labor law; land law; collective farm law; the Soviet approach to international law; the Gorbachev revolution; *perestroika* and *glasnost*. (Research Paper or Examination) (Fall—evening)

### 570 Chinese Law (2)

Emphasis on the legal system of China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Chinese concept of international law. (Research Paper) (Spring—evening)

### 571 International Negotiations (2)

The art and science of international negotiations from a practitioner's perspective: the Panama Canal Treaties, the Falkland/Malvinas Island negotiations, the problem of Cyprus, negotiating Zimbabwe's independence, U.S. military base negotiations, U.S.-Soviet summitry, global U.N. conference, North-South negotiations, national negotiating styles, two international commercial negotiations, and Track Two (citizen) diplomacy. Prerequisite or concurrent registration: Law 444 or 446; for Post-J.D. students, permission of instructor may be substituted. (Spring—evening)

### 572 Communications Law (2)

Federal regulation of the broadcasting, cable, and telephone industries. Topics include the licensing process; content regulation and political broadcasting rules; structural regulation of the broadcasting industry; cable franchising; rules governing the relationship between the cable and broadcasting industries; FCC and judicial responses to the growth of competition in the telephone industry; and the divestiture of AT&T. (Examination) (Spring—evening)

### 573 Accounting Aspects of Federal Income Taxation (2)

Problems involved in assigning items of income and deduction to the proper taxable year. General implications of timing differences, annual accounting periods, methods of accounting (particularly the cash method and the accrual method), constructive receipt and the cash equivalency doctrine, transactional problems (including the tax benefit rule and claim of right doctrine), the installment method of reporting gain, cost recovery (including depreciation), and changes in accounting periods and methods. Net operating losses and inventory accounting may also be considered. While this course entails some coverage of widely used accounting methods, it is directed principally at accounting aspects of federal taxation. Students interested primarily in securing a familiarity with financial accounting precepts should instead take Law 324, *Law and Accounting*. Prerequisite: Law 420 or its equivalent. (Examination) (Spring—evening)

### 574 Law of the Near East (2)

Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law, analysis of present-day codes, and investigation of Western influence on laws of these countries. (Research Paper)

### 577 Taxation—Special Corporation Problems (2)

Issues related to restructurings, acquisitions (taxable and tax free), liquidations, contributions to capital, consolidated returns (filing, deferred intercompany transactions, and losses), allocation of income and deductions among related taxpayers, net operating losses, and classification of instruments as debt or equity. Other issues will be considered, based on the current state and application of the federal income tax laws. Such issues have included the rules regarding the time value of money, Subchapter S corporations and controlled foreign corporations. Prerequisite: Law 424. (Choice of Research Paper or Examination) (Spring—evening)



578 **Taxation—Exempt Organizations (2)**

Hopkins

Tax-exempt organizations: policy and practice of preferred tax treatment for selected organizations and gifts to them. Statutes, regulations, and IRS practice; legislative origins, judicial interpretations, and policy considerations. Tests of qualification, disqualification, and limited tax preference. Mechanics of securing and retaining exemption; qualified exemption; unrelated business income; private inurement, political activity. Denial or loss of exemption. Return and reporting requirements. Comparative tax treatment of nonexempt and nonprofit organizations. Special sanctions with respect to private foundations, managers, and donors for improper, excessive, or prohibited activities. Enrollment may be limited. Prerequisite: Law 420. (Choice of Research Paper or Examination) (Fall—evening)

579 **Taxation—Real Estate and Income (2)**

Tucker, Gottlieb

The effect of income taxes on the real estate market and real estate transactions: sales and exchange of real estate interests; various entities for the ownership and development of real estate; the impact of taxes on the landlord and tenant; the impact of taxes on the mortgagor and mortgagee, including the choice of financing techniques, such as sale-leaseback; depreciation, amortization, and obsolescence; basis and basis adjustments; and casualties and other involuntary conversions. Prerequisite: Law 420. Law 424 is suggested but not required. (Examination) (Spring—evening)

580 **Taxation—Oil and Gas (2)**

Application of federal income tax law to producing segment of oil and gas industry. Classification of interests; treatment of exploration and development expenditures. Depletion allowance and concept of economic interests. Sales vs. leasing transactions. Organization problems. Prerequisite: Law 420. (Examination)

581 **Taxation—State and Local (2)**

Swails

Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Fall—evening)

582 **Selected Topics in Taxation—**

**Principles of Charitable Tax Planning (2)**

Intensive study of the federal income, estate, and gift tax consequences of gifts and bequests to charity, including limitations and conditions on deductions; uses of charitable trusts; private foundations; estate planning aspects of charitable transfers; and special charitable gift planning techniques. (Research Paper or Examination)

583 **Income Taxation of Foreign Business and Investment (2)**

Peroni

The provisions and policies of federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. Prerequisite: Law 420. (Examination) (Spring—day)

584 **Income Taxation of Property Transactions (2)**

Levine

An in-depth study of the federal income tax consequences relating to the sale, exchange, or other disposition of property, including stock and securities, real estate, machinery and equipment, commodities, foreign currency, patents and copyrights, contracts, goodwill and going-concern value, franchises, and other tangible and intangible property. The continued significance of the distinction between and effect of capital and ordinary gain or loss. Related areas are also examined, including the alternative minimum tax, disallowance of losses, depreciation recapture and methods of deferring recognition of gain and loss. Prerequisite: Law 420. (Examination)

585 **Federal Income Taxation of Trusts, Estates, and Beneficiaries (2)**

Rules that allocate items of income and deduction between a trust or estate and its beneficiaries. Computation of distributable net income, the distribution deduction, allocation of deductions between trust and beneficiaries, allocation of expenses to particular classes of income, tier system, treatment of specific bequests, and treatment of capital gains. The treatment of certain trusts as owned by the grantor or beneficiary and the special rules taxing certain gains of a trust at the grantor's rate; rules that determine whether a trust will be taxed under the general scheme for taxing trusts or whether it will be treated as owned by the grantor. (Examination)



- 586 Taxation—Deferred Compensation I (2)** Lieber, Holland  
Minimum tax and labor law standards of the Employee Retirement Income Security Act of 1974 (ERISA), the Retirement Equity Act of 1984 (REA), and the Pension Protection Act of 1987 applicable to pension plans. Standards include age and service requirements for plan eligibility, vesting, benefit accruals, survivor benefits, coverage of employee group, nondiscrimination (including cash or deferred plans [§401(k)], integration with social security benefits), and limits on contributions and benefits. Current developments affecting plans. (Examination) (Fall—evening)
- 587 Taxation—Deferred Compensation II (2)** Lieber, Klevan, Holland  
Rules of ERISA and the Internal Revenue Code of 1986 affecting nonqualified plans of deferred compensation: constructive receipt, cash equivalent, economic benefit, economic performance, substantial risk of forfeiture (IRC §§83, 162, 461 [h], 402 [b], and 404 [a][5]). Qualified plans: funding, deductions, distributions, qualified domestic relations orders, fiduciary standards, self-dealing, conflict of interest. (Examination)
- 588 Seminar: Tax Practice and Procedure (2)** Lauber, Kaufman  
Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation courses, including Law 420. (Problem Assignments) (Fall—evening)
- 591 Legislative Drafting (2)** Woodman, Smith, Burk, Bergman  
Advanced instruction and practice in legislative drafting; overview of legislative process with emphasis on legislative drafting. Enrollment limited to 30 students. (Problem Assignments) (Fall and spring—evening)
- 596 Graduate Clinical Studies (1, 2, 3, or 4)** Staff  
Limited to LL.M. candidates. Practical experience in the student's area of specialization or interest. The student may work with a government agency, Congressional committee, court, or other such entity performing tasks normally assigned to an attorney. Course approval must be obtained from the student's faculty adviser and/or the Dean. A maximum of 4 credit hours may be applied toward graduation. For each credit hour, 56 hours of nonremunerated work must be performed. A written report describing in some detail the specific work performed and evaluating the experience received is required. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer)
- 597 Independent Studies (arr.)** Staff  
Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)
- 598 Research in Public Law (1 or 2)** Staff  
Limited to graduate students with at least a *B* average who have had a seminar or comparable course in the field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)
- 599–600 Thesis (2–2)** Staff  
Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)
- 620–21 Legal Research and Writing (1–1)** Staff  
(For Foreign Students)  
Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)



## SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

### ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers R.E. Park, T.D. Morgan, R.E. Schechter

- 344 *Administrative Law Seminar*
- 302 *Economic Planning and the Law*
- 310 *Administrative Practices and Procedures (Food and Drug Administration)*
- 309 *Food and Drug Law*
- 300 *Practical Economics for Lawyers*
- 352 *Public Economic Policy and the Law*
- 345 *Public Policy and Mass Media*
- 325 *Regulated Industries*
- 326 *Regulation of Securities Markets*
- 308 *Securities Regulation*
- 362 *Seminar: Health Care Delivery Systems*
- 327 *Seminar: Trade Regulation*
- 305 *Takeovers and Tender Offers*
- 305 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

- 302 *Administrative Law*
- 352 *Federal Antitrust Laws*
- 350 *Unfair Trade Practices*

#### Other Related Courses

- 344 *Intergovernmental Relations I*
- 302 *Planning, Zoning, and Land Use Law*
- 359 *Use and Control of Nuclear Energy*
- 359 *Copyright Law*

### CORPORATION LAW

Faculty Advisers W.H. Painter, L.D. Solomon, H.P. Green, L.A. Stout

- 344 *Business Planning*
- 305 *Corporate Finance*
- 305 *Introduction to International Economic Law*
- 305 *Regulation of Securities Markets and Professionals*
- 305 *Regulation of Investment Advisers and Investment Companies*
- 305 *Seminar in Advanced Corporations and Securities Topics*
- 305 *Takeovers and Tender Offers*
- 305 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

- 305 *Corporations*



- 452 *Federal Antitrust Laws*
- 370 *Sales and Sales Financing*
- 326 *Securities Regulation*
- 426 *Taxation—Partnerships and Subchapter S*
- 424 *Taxation—Federal Income, Corporations and Shareholders*
- 450 *Unfair Trade Practices*

#### Other Related Courses

- 487 *Government Procurement Law*
- 583 *Income Taxation of Foreign Business and Investment*
- 538 *Law of Real Estate Financing*
- 454 *Product Liability*
- 501 *Public Economic Policy and the Law*
- 462 *Seminar: Trade Regulation*
- 577 *Taxation—Special Corporation Problems*
- 560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*

#### ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze, Jr.

The Environmental Law Program consists of course work, individual research, and clinical work, with the student selecting the mix that meets his or her particular need. Most courses are offered in the early evening so that they can be taken by students in both the day and evening divisions. Advanced courses are taught by some of the most experienced practitioners in the field.

The clinical program allows students to work for the government or for environmental lawyers in the private sector. Placements are usually available with the Departments of Justice, Energy, and Transportation, the Environmental Protection Agency, and private organizations such as the Environmental Defense Fund, the Natural Resources Defense Council, and the National Wildlife Association. The clinical program offers the student with very specific environmental interests a chance to develop these interests in a work setting. Thus, students with interests in topics such as wetland acquisition, historical protection, or wildlife protection can take relevant course work and then further specialize through the clinical program. If the student is interested in individual research, course credit is also available for this type of study.

- 411 *Air Pollution Control*
- 414 *Clinical Studies in Environmental Law*
- 548 *Control of Toxic and Hazardous Substances (RCRA & CERCLA)*
- 410 *Environmental Law*
- 544 *Environmental Planning*
- 546 *Natural Resources Law*
- 415 *Occupational Safety and Health Legislation*
- 545 *Regulation of Chemicals (FIFRA & TSCA)*
- 455 *Toxic Tort Litigation*
- 550 *Use and Control of Nuclear Energy*
- 551 *Comparative Environmental Law*
- 547 *Water Pollution Control*
- 543 *Water Resources Law*
- 557 *Comparative Environmental Litigation*



## Individual Research

- 314 Legal Writing (J.D. Candidates)
- 598 Research in Public Law (Master's Candidates)
- 599-600 Thesis

## Other Related Courses

- 342 Administrative Law
- 344 Administrative Law Seminar
- 386 Admiralty
- 549 Energy
- 509 Food and Drug Law
- 487 Government Procurement Law
- 566 International Law of Air and Space
- 567 International Law of the Sea
- 591 Legislative Drafting
- 398 Modern Real Estate Transactions
- 500 Practical Economics for Lawyers
- 501 Public Economic Policy and the Law
- 345 Regulated Industries
- 508 Seminar: Health Care Delivery Systems
- 580 Taxation: Oil and Gas
- 581 Taxation: State and Local

## GOVERNMENT CONTRACTS PROGRAM

Director F.J. Lees

Faculty Advisers R.C. Nash, Jr., John Cibinic, Jr.

A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

- 586 Government Contracts
- 587 Government Procurement Law
- 589 Administration of Government Contracts
- 590 Government Contracts Cost and Pricing
- 591 Intergovernmental Relations I
- 592 Seminar: Government Contracts

## Other Related Courses

- 586 Business Planning
- 587 Collective Bargaining and Labor Arbitration
- 589 Computers and the Law
- 590 Environmental Law
- 591 Equal Employment Claims and Litigation
- 592 Equal Employment Opportunity
- 593 Federal Antitrust Laws
- 594 Federal Jurisdiction
- 595 Labor Law
- 596 Labor Standards



- 446 *International Business Transactions*
- 591 *Legislative Drafting*
- 563 *Negotiation: Concepts and Techniques*
- 464 *Patent Law*
- 424 *Taxation—Federal Income, Corporations and Shareholders*
- 450 *Unfair Trade Practices*
- 550 *Use and Control of Nuclear Energy*

#### INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Acting Director R.G. Steinhardt

Faculty Advisers J.E. Alvarez, T.E. Buerghenthal, J.A. Spanogle

The objectives of the International and Comparative Law Program are to provide insights, skills, and substantive understanding of international law and foreign legal systems. Specific objectives in international law are to provide an understanding of decision making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries, and the role of decisional law and judicial review in selected legal systems. Improvements that are needed to promote the rule of law in the world community are also considered. International aspects of business transactions and economic development are included in the program, as are human rights and the control of state violence. The objectives of the program are implemented through course work and research seminars for both J.D. and post-J.D. students.

The basic courses for the International and Comparative Law Program are Law 444, *International Law*, Law 446, *International Business Transactions*, and Law 438, *Comparative Law*.

- 506 *Advanced Problems in International Business Transactions*
- 504 *Advanced Problems in Public International Law*
- 570 *Chinese Law*
- 443 *Foreign Relations, National Security, and the Constitution*
- 448 *International Arbitration*
- 449 *International Civil Litigation*
- 568 *International Humanitarian Law of Coercion Control*
- 566 *International Law of Air and Space*
- 565 *International Law of Human Rights*
- 567 *International Law of the Sea*
- 571 *International Negotiations*
- 505 *International and U.S. Regulation of Foreign Trade*
- 561 *Law of the European Communities*
- 562 *Law of Japan*
- 574 *Law of the Near East*
- 569 *Soviet Law*

#### Other Related Courses

- 386 *Admiralty*
- 551 *Comparative Environmental Law*
- 440 *Conflict of Laws*
- 360 *Immigration Law*
- 583 *Income Taxation of Foreign Business and Investment*
- 550 *Use and Control of Nuclear Energy*



## LABOR AND EMPLOYMENT LAW

Faculty Adviser C.B. Craver

- 527 *Equal Employment Claims and Litigation*
- 524 *Equal Employment Opportunity*
- 522 *Internal Union Affairs*
- 521 *Labor Relations in the Federal Service*
- 520 *Labor Standards*
- 415 *Occupational Safety and Health Legislation (OSHA)*
- 341 *Seminar: Labor Law*
- 526 *Seminar: Labor Litigation*
- 529 *Seminar: Public-Sector Labor Law*

Master of Laws candidates in the area of Labor Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

- 340 *Collective Bargaining and Labor Arbitration*
- 338 *Labor Law*

### Other Related Courses

- 460 *Problems of the Consumer*
- 587 *Taxation—Deferred Compensation II*

## LAND USE MANAGEMENT AND CONTROL PROGRAM

Director J.M. Brown

Faculty Advisers J.M. Brown, L.A. Schiller, J.P. Chandler

The social, economic, technological, political, and legal interrelationships generated by the fact that land is a basic, limited-supply natural resource, capable of being subjected to differing but concurrent public and private uses, raise a growing number of issues involving management policy and control measures that are of critical concern to the future of the nation. The Land Use Management and Control program, through a combination of academic, clinical, and game-simulation processes, seeks to provide an understanding of existing and pending problems, needs, means, and opportunities for solution with respect to this developing area of national concern.

- 462 *Planning, Zoning, and Land Use Law*
- 463 *Seminar: Current Problems in Land Use Management and Controls*
- 464 *Land Use Administrative Process*
- 465 *Land Development Law*
- 466 *Local Government Law*
- 467 *Environmental Law*
- 468 *Law of Real Estate Financing*
- 469 *Survey of the Secondary Mortgage Market*
- 470 *Intergovernmental Relations I*
- 471 *Water Resources Law*
- 472 *Natural Resources Law*
- 473 *Taxation—Real Estate and Income*
- 474 *Taxation—State and Local*

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.



- 342 *Administrative Law*
- 398 *Modern Real Estate Transactions*

#### Other Related Courses

- 322 *Agency and Partnerships*
- 325 *Corporations*
- 326 *Securities Regulation*
- 344 *Administrative Law Seminar*
- 345 *Regulated Industries*
- 362 *Legislation*
- 380 *Remedies*
- 382 *Insurance*
- 394 *Community Property/Marital Property*
- 411 *Air Pollution Control*
- 414 *Clinical Studies in Environmental Law*
- 442 *Jurisprudence*
- 482 *Disabled People and the Law*
- 487 *Government Procurement Law*
- 500 *Practical Economics for Lawyers*
- 501 *Public Economic Policy and the Law*
- 544 *Environmental Planning*
- 545 *Environmental Litigation*
- 548 *Control of Toxic and Hazardous Substances (RCRA & CERCLA)*
- 550 *Use and Control of Nuclear Energy*
- 563 *Negotiation: Concepts and Techniques*
- 580 *Taxation—Oil and Gas*
- 591 *Legislative Drafting*
- 596 *Graduate Clinical Studies*

#### PATENT AND INTELLECTUAL PROPERTY LAW PROGRAM

*Director* D.W. Banner

The Patent and Intellectual Property Law Program is designed for students in the J.D. and post-J.D. degree programs whose intentions are to specialize in the practice of patent, copyright, or trademark law. An organized program has been developed to offer as complete and as integrated a collection of courses in these fields of law as possible. The program's course offerings now total 19 semester hours (12 of which are in patent law), one of the most extensive in the United States. (See the Patent and Trade Regulation Law area of specialization in the Advanced Courses section of this Bulletin.) The object of the Patent and Intellectual Property Law Program is to provide the student with a concentration in this field of law at a level of specialization and maturity that can enable advancement far more rapidly than usual in this field.

- 554 *Advanced Topics in Patent Law*
- 553 *Chemical Patent Practice*
- 559 *Copyright Law*
- 558 *International and Comparative Patent Law*
- 552 *Patent and Know-how Licensing*
- 560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*



Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

- 452 *Federal Antitrust Laws*
- 464 *Patent Law*
- 466 *Patent Office Practice*
- 450 *Unfair Trade Practices*

#### Other Related Courses

- 468 *Computers and the Law*
- 487 *Government Procurement Law*
- 469 *Seminar: Law of Privacy*
- 462 *Seminar: Trade Regulation*

#### TAXATION

Faculty Advisers L.D. Solomon, R.J. Peroni, C.D. Block, T.S. Sims

- 422 *Taxation—Federal Estate and Gift*
- 573 *Accounting Aspects of Federal Income Taxation*
- 583 *Income Taxation of Foreign Business and Investment*
- 582 *Selected Topics in Taxation—Principles of Charitable Tax Planning*
- 595 *Seminar: Estate Planning*
- 428 *Seminar: Special Problems of Tax Policy*
- 588 *Seminar: Tax Practice and Procedure*
- 584 *Income Taxation of Property Transactions*
- 585 *Federal Income Taxation of Trusts, Estates, and Beneficiaries*
- 586 *Taxation—Deferred Compensation I*
- 587 *Taxation—Deferred Compensation II*
- 578 *Taxation—Exempt Organizations*
- 580 *Taxation—Oil and Gas*
- 426 *Taxation—Partnerships and Subchapter S*
- 579 *Taxation—Real Estate and Income*
- 577 *Taxation—Special Corporation Problems*
- 581 *Taxation—State and Local*

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

- 424 *Law and Accounting*
- 460 *Taxation—Federal Income*
- 424 *Taxation—Federal Income, Corporations and Shareholders*

#### Other Related Courses

- 584 *Business Planning*
- 460 *International Business Transactions*
- 426 *Securities Regulation*



## GENERAL ALUMNI ASSOCIATION

*President* John R. Manning

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and college.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.



## THE GEORGE WASHINGTON LAW ALUMNI ASSOCIATION

The George Washington Law Alumni Association was founded in 1912 and has been affiliated with the General Alumni Association since 1926. Its purposes as stated in the constitution are to promote high standards of legal education, to keep the alumni of the school in close touch with each other, and to further the interest of the school. Eligible members are those who have matriculated at the school or National University and have left in good standing, and any member or former member of the faculty of the school. Active members are those eligible members who are current contributors to the Law Annual Support Program of the University and life members of the George Washington Law Alumni Association. The Association periodically publishes the Law Alumni Directory. Law alumni are urged to keep the Alumni Office informed of their whereabouts so that directory information can be kept to date. The Law Alumni Office is in the Jacob Burns Law Library, 716 Twentieth Street, N.W., Washington, D.C. 20052.

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## THE UNIVERSITY

### HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets. During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as Foggy Bottom, between Twentieth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Twentieth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center, the Elliott School of International Affairs, and the Schools of Medicine and Health Sciences, Engineering



and Applied Science, Education and Human Development, and Government and Business Administration; and the Division of Continuing Education.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

#### ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. The University is on the approved list of the American Association of University Women and is a member of the College Board.

#### LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

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# SUMMARY OF REGISTRATION, FALL SEMESTER 1988

	1st year	2nd year	3rd year	4th year	Graduate	Other
Day . . . . .	372	349	358	66	2	
Evening . . . . .	73	71	64	65	131	8
Total 1,559						



## COLLEGES AND SCHOOLS—DEGREE PROGRAMS

*Columbian College of Arts and Sciences:* Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

*Graduate School of Arts and Sciences:* Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

*School of Medicine and Health Sciences:* Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

*National Law Center:* Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L.[Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

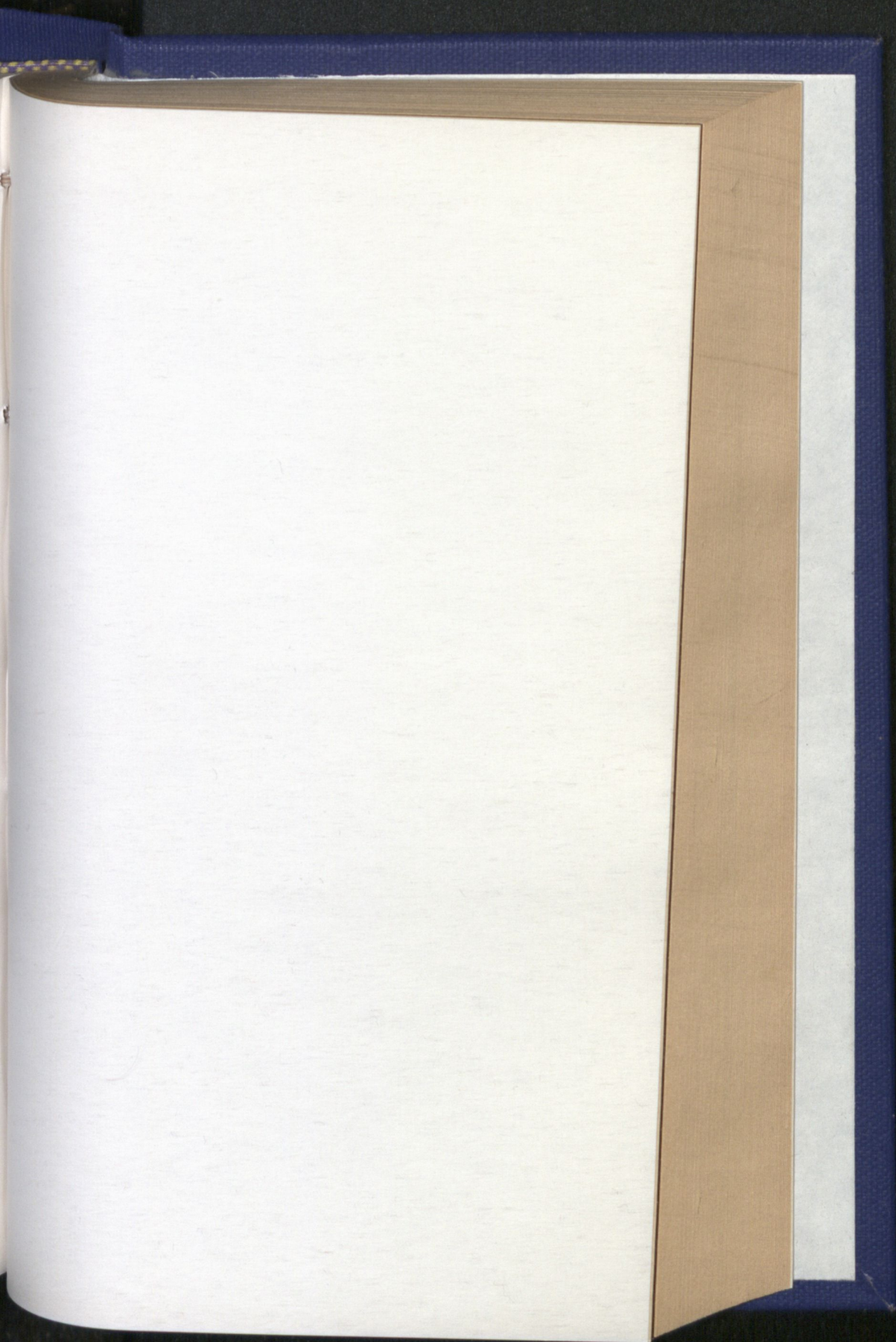
*School of Engineering and Applied Science:* Bachelor of Science (Civil Engineering) (B.S.[C.E.]), Bachelor of Science (Computer Science) (B.S.[C.S.]), Bachelor of Science (Electrical Engineering) (B.S.[E.E.]), Bachelor of Science (Mechanical Engineering) (B.S.[M.E.]), Bachelor of Science (Systems Analysis and Engineering) (B.S.[S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

*School of Education and Human Development:* Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

*School of Government and Business Administration:* Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), and Doctor of Philosophy (Ph.D.)

*Elliott School of International Affairs:* Bachelor of Arts (B.A.) and Master of Arts (M.A.)







The  
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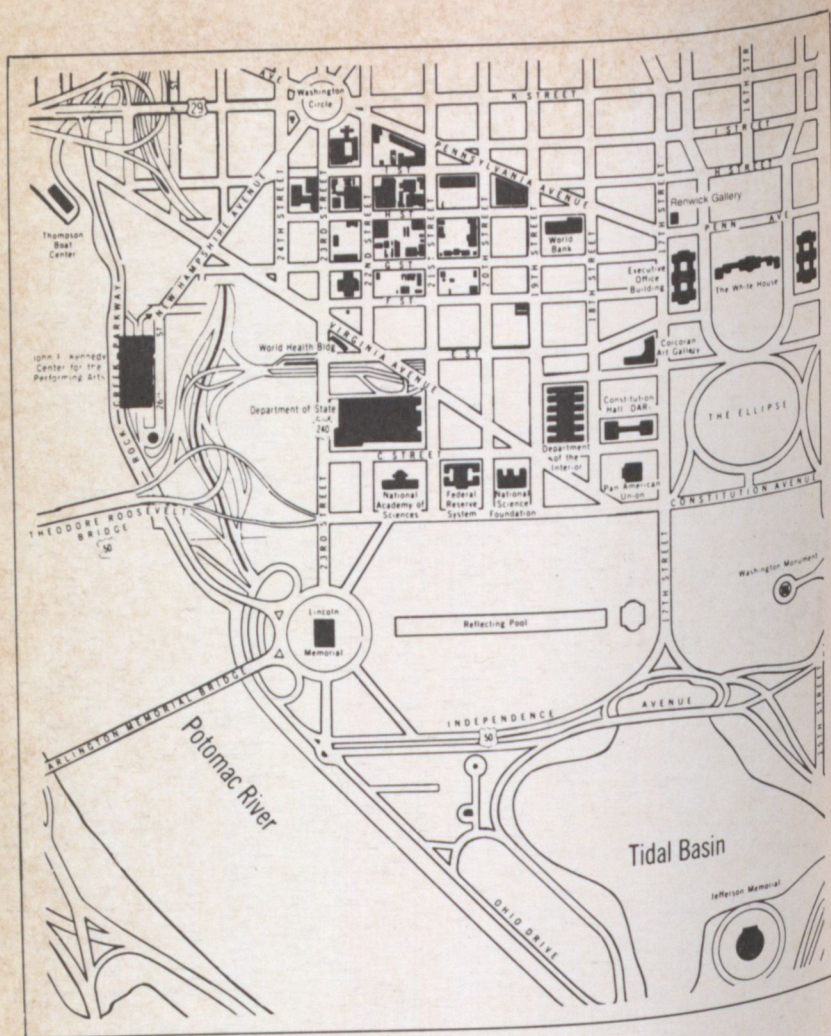


The George  
Washington  
University  
Bulletin

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School of Engineering  
and Applied Science  
1989–1990





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# The George Washington University Bulletin

## School of Engineering and Applied Science 1989-1990

Washington, D.C. 20052

(202) 994-6158  
(202) 537-7327



## To All Prospective Students:

The School of Engineering and Applied Science has been in continuous session since 1884 and offers programs of study leading to bachelor's, master's, professional, and doctoral degrees. Its primary objective is to help the student develop a well-trained mind by providing optimal educational opportunities for achieving and maintaining professional competence. This includes the development of flexibility for continuing competence; the School's programs are designed to promote successful adaptation to rapidly changing technology in future careers.

This Bulletin describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honor Scholarships, Cooperative Education Program in Engineering, and educational and research opportunities offered by the Joint Institute for Advancement of Flight Sciences (JIAFS), several other specialized research institutes, and the Industrial Liaison Program.

Engineering Honor Scholarships and Fellowships have been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only, and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings may help pay for part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA-Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA-Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching in the flight sciences.

The School of Engineering and Applied Science is a professional school in a university comprising eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The Washington metropolitan area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students before and after graduation.

The atmosphere of the School is one of serious-minded effort toward mature academic development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Alumni of the School are engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in engineering education and the engineering profession.

The faculty of the School and I look forward to a mutually challenging relationship with you. If you wish additional information, please do not hesitate to call upon the department chairmen or me.

Harold Liebowitz  
Dean



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## Calendar 1989-1990\*

<b>1989</b>	<b>Fall Semester</b>
August 22-23	Orientation for students from foreign countries
August 24-25	Orientation and placement tests for new students
August 28-30	Registration
August 31	Classes begin
September 4	Labor Day (holiday)
September 8	Fall Convocation
October 1	Applications for February graduation due
November 1	Applications for spring semester financial aid due
November 23-24	Thanksgiving holiday
November 27	D.Sc. dissertations due from February candidates
December 7	Last day of fall semester classes
December 11-19	Examination period
<b>1990</b>	<b>Spring Semester</b>
January 3	Master's theses due from February candidates
January 4-5	Orientation for new students and students from foreign countries
January 8-10	Registration
January 11	Spring semester classes begin
January 15	Martin Luther King Day (holiday)
January 19	Deadline for completion of all degree requirements for D.Sc. February candidates
February 1	Applications for May graduation due
February 18	Winter Convocation
February 19	George Washington's birthday observed (holiday)
March 1	Deadline for submission of 1990-91 undergraduate financial aid applications
March 2	D.Sc. dissertations due from May candidates
March 12-16	Spring recess
April 1	Deadline for submission of summer sessions and 1990-91 graduate financial aid applications
April 16	Master's theses due from May candidates
April 20	Deadline for completion of all degree requirements for D.Sc. May candidates
April 27	Last day of spring semester classes
May 1-10	Examination period
May 13	Commencement

\*Academic calendar is subject to change.  
Registration procedure and hours of registration will be stated in the *Schedule of Classes*, available well in advance of each semester.



## The Study of Engineering

The engineering profession extends into many areas of industry, research, commerce, and the arts. Engineers address problems in the manufacturing sector, such as the design of mechanical, electrical, and chemical processes, equipment, and plants; in the design and construction of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the automotive industry; in the missile and space programs; in energy resources and power and in the generation and transmission of power; in modern communication; in traffic control; in city planning; in public health and sanitation as it affects the environment; and in ventilation and refrigeration. This list is far from exhaustive, but it demonstrates the diversity of the profession and the many opportunities to specialize.

## The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. A President's Scientific Advisory Committee has pointed out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in [a] chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge to serve society, financial considerations, human resources, and society's needs intersect. The engineer is concerned, therefore, with the means for operating a dynamic society and must consider not only whether sufficient knowledge exists to create a product but also how the product can be built, who will use it, and how its use will affect the environment in which it will operate.

## The Professional Engineer

Engineers are concerned with the quality and preservation of human life. The engineer makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of being an intellectual agent in the practical world. This responsibility of the engineer arises from the broad implications of engineering for the whole of society as well as from the stringent requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that even though the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs in other areas have been made, this impact of engineering on modern life is just a preview of the engineering of tomorrow.



## Engineering Education

A rapidly changing profession requires education for the future based on fundamental principles of science applicable to a dynamic, advanced society. In the fields of engineering and applied science, there is no substitute for demonstrated competence; without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze all aspects of a problem, to formulate solutions, and to evaluate those solutions in light of all available information. To assure that students' undergraduate education will enable them to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates the undergraduate program.

The curricula of the School of Engineering and Applied Science are designed to assist students in preparing for careers in engineering and applied science. This requires that students master the principles on which future practice will be based. An education centered on the junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, and other disciplines, requires scholars. But in any of these areas, the student who has not achieved high scholastic standing can find a place if he or she has genuine interest and is willing to work. It is difficult to generalize, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Intellectual curiosity and the desire to learn and to work hard can be good indicators of success. A school or college can give an education. It can offer only the opportunity to learn.



## **The School of Engineering and Applied Science**

### **History**

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University. The School was named in honor of William W. Corcoran, president of the Corporation and the Board of Trustees of the University from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to the creation of the Washington College of Engineering in 1905 as one of several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to degrees in engineering and architecture.

In 1909 the name was changed to the College of Engineering and Mechanical Arts, and the curricula were revised to give students a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which students could build and by which they might solve new problems met in practice.

The name of the school was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis on principles rather than technology, which had characterized the program since 1903, was continued and has remained a distinguishing feature of the School.

The name School of Engineering and Applied Science was adopted in 1962.

### **Academic Status**

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Board.

All undergraduate engineering curricula in the School of Engineering and Applied Science are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The undergraduate computer science curriculum is accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board.

### **University Policy on Equal Opportunity**

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran



status. This policy covers all programs, services, policies, and procedures of the University, including admission to education programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Susan B. Kaplan, Special Assistant to the President, George Washington University, Washington, D.C. 20052, (202)994-6500, or to the Assistant Secretary for Civil Rights of the U.S. Department of Education.



## Undergraduate Study

The undergraduate program provides a solid foundation in the basic principles, concepts, and techniques of engineering and applied science, on which individuals may build technical competence in a variety of areas as their professional careers develop. The program prepares students for careers in engineering and applied science as they exist today and as they may develop in the future.

Undergraduate study is the beginning of a lifelong program of education. The School provides an environment that fosters the attitudes and disciplines essential to professional growth. Graduates are prepared for productive work in their chosen fields and for further development, both formal and informal. The undergraduate curricula also include courses in the humanities and social sciences so that students understand and appreciate these areas. Since the School cannot predict either a student's response to academic demands or the program that will prove most effective for the student to follow, the undergraduate program has been designed to offer a variety of experiences.

The School is a place for learning and for formulating, exchanging, and exploring ideas. During the undergraduate years, the student is led to strengthen skills in analysis and talent for creative activity through liberal use of laboratory projects. Independent thought and original ideas count more heavily in the appraisal of student achievements than does rote recital of information.

To allow undergraduate students to combine academic learning with practical, firsthand experience in engineering, the School has an optional Cooperative Education Program in Engineering in which industrial and governmental organizations employ students at prevailing salary rates. Every effort is made to place students in positions that provide the best possible experience consistent with career plans. These work periods provide students with income that may be



used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

### Admission to Undergraduate Study

Admission is the first in a series of qualifying steps in the student's progress toward professional competence in engineering or computer science. It indicates the School's belief that the applicant has at least the minimum preparation and ability needed to complete the curriculum successfully. The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Admission application forms are available from the Office of Admissions, George Washington University, Washington, D.C. 20052. The form must be filled out completely and returned with the stated application fee, paid by check or postal money order payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of his or her last registration at GWU and who has not since registered at another institution.

### Entering Freshmen

Consideration for admission is based on the following: (1) an acceptable certificate of graduation from an accredited high school showing at least 16 units;\* (2) scores on the College Board Scholastic Aptitude Test (SAT) or on the American College Testing (ACT) battery; (3) high school grades; (4) class standing. Although no minimum scores are prescribed, test results are considered in determining admission eligibility. Students whose combined SAT scores are below 1100 (600 mathematics) or whose ACT composite scores are below 27 (28 mathematics) must show superior academic performance in their high school programs in order to be accepted for admission. In addition, although College Board Achievement Tests in English composition and mathematics are not required for admission to the School of Engineering and Applied Science, it is recommended that applicants submit scores on these tests.

Twelve of the 16 units required for admission must be distributed as follows: four in English; four in mathematics, including two in algebra, one in plane geometry, one-half in trigonometry, and one-half in precalculus, analytical geometry, or functions; one in physics; one in chemistry; and two in history or a foreign language. General science courses do not satisfy the science requirement but may be counted as elective units.

Applicants who do not meet the above requirements may be considered by the School, but additional mathematics or English placement tests may be prescribed.

A graduate of an approved high school who lacks not more than two units (only one of which may be a mathematics or science requirement) of the required subjects and who presents 16 acceptable units may be admitted to a prescribed program that includes courses to make up the deficiencies.

\*A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 60-minute periods of prepared classroom work.



Applicants from secondary schools must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

Applicants who wish to begin study in the summer sessions or fall semester should formulate plans early in the senior year of high school. Although applications should be submitted by March 1, late applications will be accepted on a space-available basis. Students who wish to be considered for financial aid or on-campus housing, however, must submit their applications and all required documents by March 1. Students who wish to begin study in the spring semester should submit their applications, transcripts, and other required documents no later than November 1.

Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after November 1 to students whose applications become complete with secondary school records through the junior year and junior-year test scores, provided these records clearly establish admissibility.

### Transfer Students

Undergraduate students from other institutions should submit all applications and required credentials prior to June 1 for the fall semester, December 1 for the spring semester, and April 1 for the summer sessions.

To be considered for admission as a transfer student, an applicant must be in good standing as to scholarship and conduct at all postsecondary institutions previously attended and should have a minimum grade-point average of 2.7 on a 4.0 scale. A student who has been academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher education must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, even if credits were not earned.

If an applicant has fewer than 30 semester hours of acceptable work (C or better in academic courses from an accredited institution) at the time the application is submitted, his or her high school record and College Board or ACT test scores must be sent to the Office of Admissions directly from the high school and testing agency.

All applicants whose native language is not English, including those transferring from other U.S. universities, must fulfill the language test requirements listed under Students from Foreign Institutions, below.

### Students from Foreign Institutions

**Required Records.** At the time the application is sent, the applicant must have the educational institutions previously attended send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation.



**Financial Certificate.** If an international student plans to study at this University under the authorization of either a student (F) or exchange visitor (J) visa, a Form I-20 or IAP-66 cannot be issued until the student has been admitted to the University and has completed a George Washington University Financial Certificate satisfactorily. The Financial Certificate may be obtained from the Office of Admissions or the School of Engineering and Applied Science. It requests information about the financial resources available to the student to pay his or her educational and living expenses while in the United States. The certificate should be accompanied by supporting documents, such as bank statements or letters from governments authorizing scholarship awards.

**Language Test.** All applicants whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL), and the University looks for a minimum score of 550 in considering candidates for admission. Applicants are responsible for making arrangements to take the test and should address inquiries to TOEFL, Educational Testing Service, CN 6151, Princeton, New Jersey 08541-6151, U.S.A., well in advance of the beginning of the semester for which admission is sought. On the application for the test, the student should specify that the scores are to be sent directly to the Office of Admissions, George Washington University, Washington, D.C. 20052. Registration for the TOEFL does not constitute application for admission to George Washington University.

In addition, admitted students who did not score at least 600 on the TOEFL and 5 out of 6 on the Test of Written English (TWE) will be required to take the GWU English as a Foreign Language (EFL) placement test prior to registration. The results of this test will determine what level of EFL course work, if any, the student will be required to complete before beginning a full program of study in a SEAS curriculum. Such course work will extend the period of time needed to complete the degree. (See page 185 for additional information on EFL courses.)

### Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer sessions excluded) must apply for readmission. Deadlines for readmission applications are the same as those for undergraduate or graduate admission. If a student has attended one or more institutions of higher education while absent from the University, the student must have complete official transcripts sent to the appropriate office at this University from all institutions attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time he or she last registered at this University and who has not since registered at another academic institution.

### Advanced Standing

#### Credit by Examination

Assuming there is no duplication of course work, a maximum of 30 semester hours of credit may be assigned upon admission to the University for any combination of the following.

**College Board Advanced Placement (AP) Tests.** On the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request, undergraduate credit is assigned for scores of four or five



on all Advanced Placement Tests except the test in Studio Art, for which no credit is awarded. Test scores below four are not accepted for assignment of academic credit. The Advanced Placement Tests are administered in secondary schools in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Board, Advanced Placement Tests, CN 6671, Princeton, N.J. 08541-6671.

**College Board College-Level Examination Program (CLEP).** CLEP offers two types of examinations: General and Subject. CLEP General Examinations are offered in five areas: mathematics, social sciences and history, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in 30 subjects.

**New Students.** Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in social science and history (6 semester hours) and humanities (6 semester hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 semester hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations that are applicable to the School's curricula and are passed at the level recommended in the College Board model policy.

**Registered Students.** A candidate for a degree (i.e., a student already registered at the University) must seek departmental approval prior to taking a CLEP Subject Examination for credit. Credit may not be earned by passing the examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the examinations are the responsibility of the applicant and should be made with the College Board College-Level Examination Program, CN 6601, Princeton, N.J. 08541-6601.

**Department Examinations for Waiver or Credit.\*** Registered SEAS students may also take examinations in some academic departments for waiver or credit for a specific course upon approval of the appropriate department chair; before the test is administered, the student must have demonstrated sufficient preparation to warrant being given the test. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

### Makeup of Credit for Waived Courses

If a course required by the engineering curriculum is waived, the corresponding semester hours of credit must be earned by satisfactory completion of a university-level academic course, either technical or nontechnical, approved by the student's faculty adviser or department chair. If the substituted course would normally be considered part of the engineering curriculum, the grade earned

\*This does not apply to courses offered in the Department of Electrical Engineering and Computer Science.



will be used in determining quality-point index, Dean's List, probation, and suspension. If the substituted course is not part of the engineering curriculum, the grade will not be included in the above computations.

### **Waiver of the English Course Requirement**

A waiver of the English course requirement in the core curriculum will be granted to those who achieve a score of 650 or higher on the English Composition Achievement Test of the College Board, a score of 58 or higher on the Test of Standard Written English (TSWE) portion of the SAT, or a score of 28 or above on the ACT English Usage Test.

### **Credit from Other Institutions of Higher Learning**

When no duplication is involved, either through course work or examination, advanced standing may be granted for work successfully completed at other accredited institutions of higher learning. Credit will be granted only when such work meets the requirements for the degree sought at this University. Courses graded *D*, or the equivalent, or lower will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University. Students should complete a Transfer of Credit worksheet, available in the SEAS Admissions and Registration Office, and present the worksheet to their adviser for final approval.

### **Credit from Service Schools**

A limited amount of credit may be assigned for selected service school courses. No more than 30 semester hours may be assigned for a combination of service school training and the examinations listed above. Students seeking such credit should consult the Office of Admissions.

### **Credit from Baltimore Polytechnic Institute**

Credit will be assigned to students who have earned scores of 80 or above in A-level courses at Baltimore Polytechnic Institute equivalent to the following SEAS core courses: Math 31, 32; Phys 13, 15; Chem 13; EngS 4; CSci 51.

## **Regulations**

Regulations regarding registration, fees, and finances are stated on pages 188-93; other University regulations, on pages 204-8.

### **Student Status**

For the purpose of defining student status, undergraduates taking 12 or more semester hours and graduates taking 9 or more semester hours are considered to be full-time students. All other students are considered to be part time.

### **Attendance**

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular



attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend all meetings of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, including work missed because of absence. Excuses for absences from examinations that have been announced in advance can be obtained only by written application to the instructor in charge of the course.

### Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 21 semester hours. Students on probation may not register for more than 12 semester hours. A student employed more than 24 hours a week may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the adviser's permission.

### Advisory System

Every entering undergraduate student is assigned a faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, achievement and maintenance of satisfactory scholastic performance, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their advisers on all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School. All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the dean, associate dean, department chair, and adviser concerning any student problems. Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final responsibility for a student's action lies with the student.

### English Placement Test

For the guidance of the student and the adviser, beginning freshmen who have not waived English 9 or 10 through their English Composition Achievement Test scores or the TSWE (see Waiver of the English Course Requirement, above) must take the placement examination in English. Results on the English placement test determine the level of the English course the student will take.

### Scholarship

**Grades.** Grades are mailed to the student by the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: A, Excellent; B, Good; C, Satisfactory; Low Pass; F, Fail; I, Incomplete; IP, Progress; W, Authorized Withdrawal; Z, Unauthorized Withdrawal. The symbol Z is assigned when a student is registered for a course that he or she has not attended and for which he or she has done substantial graded work.



**Pass/No Pass Grading System.** SEAS students may not take courses required for graduation on the pass/no pass (*P/NP*) grading system. They may, however, take courses outside their regular engineering academic program under this grading system.

Students whose status of probation or suspension depends on a grade of *P* are given 30 days to have the grade changed. If not changed by the end of that period, the *P* will be considered a *C* for probation, suspension, Dean's List, and graduation purposes, and a grade of *NP* will be considered an *F*.

**Incompletes.** The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change.

If a grade of *I* is not changed to a letter grade of *A*, *B*, *C*, *D*, *F*, or *Z* within 30 days, then decisions on probation, removal from probation, suspension, Dean's List, and graduation will be made with the information on hand, in conformance with SEAS regulations, excluding the *I* grade(s).

Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. A grade of *I* that is not removed after one calendar year will be changed on the permanent record to a grade of *F*. A course in which a student receives an *F* in this way must normally be repeated. The grade to which the *I* is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, quality-point index, and Dean's and other honor lists.

**Midsemester Warning.** At the end of the seventh week of each semester, instructors are expected to report to the dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice, a student must consult with the appropriate instructor and faculty adviser immediately. The adviser may prescribe diagnostic tests or remedial study, or both, to be completed before the end of the semester.

**Note.** Grades discussed in the sections below include all grades earned at George Washington University and through the Consortium universities while the student is enrolled at GWU. The grades considered are for academic courses taken in fulfillment of degree requirements and as prerequisites for degree requirements, and not for remedial courses or those taken to make up deficiencies. (For example, EFL courses numbered 45 and below will not be considered for purposes of probation, suspension, or Dean's List.)

Social science, humanities, or technical elective courses taken in excess of the number needed to fulfill the requirements in these areas (including graduate-level courses) are not considered in determining probation, suspension, graduation, or Dean's List status. Only those courses initially taken to meet the requirements will be included in these determinations.



**Quality-Point Index.** Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses marked *W*, *I*, or *Z* are not considered in determining the index, except that courses marked *I* will be included in the index when a final grade is recorded. All other grades received by a student at George Washington University, regardless of his or her status (i.e., degree, nondegree, or College Program for Secondary School Students), will count in the SEAS quality-point index if the courses are part of the SEAS curriculum.

**Probation.** A full-time student will be placed on probation if his or her quality-point index is less than 2.0 for one semester or if he or she receives more than one grade of *F* in one semester or summer session. A part-time student will be placed on probation if his or her quality-point index is less than 2.0 or he or she has received more than one grade of *F* when he or she has accumulated 12 semester hours. For academic purposes, a new grading period will begin once this accumulation is reached.

A student on probation who receives a quality-point index of 2.0 or better (for 12 or more credit hours) during the semester on probation but also receives a grade of *F* will be placed on continued probation. Students in this category who receive two *F*s will be suspended.

A full-time student will be removed from probation when his or her engineering curriculum quality-point index is 2.0 or more with no grade of *F* during the semester on probation. A part-time student will be removed from probation when his or her engineering curriculum quality-point index is 2.0 or more and he or she receives no grade of *F* for the next 12 semester hours after being placed on probation.

**Suspension.** The following cases constitute grounds for suspension: (1) receipt of two grades of *F* any time during a probation period (part-time students receiving two grades of *F* while on probation will be suspended at the time of receipt of the second of these grades); (2) placement on probation in two consecutive semesters (or the equivalent for part-time students); (3) receipt of four grades of *F* in any semester (or the equivalent for part-time students); (4) placement on probation for a third time, whether or not the probation periods are consecutive; (5) accumulation of a quality-point index of (a) 1.5 or less at the end of the sophomore year or upon completion of the 63rd credit in the student's curriculum, (b) 1.9 or less at the end of the junior year or upon completion of the 64th credit in the student's curriculum, or (c) less than 2.0 at any time during the junior year.

Department faculty may designate additional courses to be taken and grades to be received by students who fail to meet but come close to meeting the graduation requirements. Suspension may be held in abeyance until the conditions are or are not met.

Students admitted on probation will be suspended if they do not attain a minimum quality-point index of 2.0 during their first semester (12 or more credit hours) or if they receive more than one grade of *F* during the period.

Once suspended, a student may not have that suspension rescinded by a grade change at a later date. The student may, however, apply for readmission during the grade change. Students who have been suspended may not apply for readmission until one year after the suspension. To be considered for readmission, a student must have undertaken academic work at another institution,



primarily in mathematics, science, or engineering, during the year of suspension and earned a grade-point average of at least 2.7.

**Dean's Honors and Commendation Lists.** The faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List and a Dean's Commendation List, which contain the names of candidates for undergraduate degrees whose scholastic achievements satisfy all of the following requirements while enrolled in an approved engineering curriculum.

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.5 or higher for the Dean's Honors List and a quality-point index of 3.0 or higher for the Dean's Commendation List, with no more than one grade of C.
2. No grade below C may have been received during the qualifying period.
3. No disciplinary action may have been taken against the student.

The grades used to compute the quality-point index that determines eligibility for the Dean's Honors and Commendation Lists are those used to meet the SEAS graduation requirements. A student who receives a grade of I during a semester will not be placed on the Dean's Honors or Commendation List for that semester unless the I is removed no later than 30 days after the end of the marking period and the student continues to meet all the requirements for the Dean's Honors or Commendation List.

### Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the associate dean. The associate dean may assign supplementary work, without academic credit, varying with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the associate dean.

### Graduation Requirements

See page 206 for general requirements for graduation.

**Residence.** A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the dean, the work of the final year must be completed in residence.

**Scholarship.** To be eligible for graduation a student must have (1) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semesters of the curriculum and (2) a 2.00 overall average for the entire engineering academic program taken at SEAS.

**Honors.** Bachelor's degrees with honors are awarded to students whose academic records give evidence of particular merit. The student's quality-point index determines the level of honors as follows: *cum laude*, 3.4–3.59; *magna cum laude*, 3.6–3.79; *summa cum laude*, 3.8–4.0. The quality-point index is calculated by the Office of the Registrar, and the honors designation is entered on the transcript and diploma of those students who earn an honors designation. To be eligible, a student must complete a minimum of 60 hours of course work at GWU.

**Special Honors.** A bachelor's degree may be conferred with Special Honors, on recommendation of the faculty, for outstanding achievement in the student's senior-year work. The student must fulfill all of the following requirements.



1. The student must have candidacy for Special Honors approved by the department chair representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. The student must earn a quality-point index of a least 3.00 on all work taken at GWU that applies to his or her engineering program.
4. The student must have completed at GWU at least one-half of the work required for the degree.

## Undergraduate Curricula

The undergraduate curricula lead to the degree of Bachelor of Science, with parenthetical designation of the major—for example, Bachelor of Science (Electrical Engineering). Full-time students normally complete the curriculum in four years. Students whose academic backgrounds do not meet SEAS admission requirements may need more time; those who are admitted with advanced standing or who attend summer sessions can complete the degree in less time.

The program of the first four semesters (core curriculum), with some exceptions, is common to all curricula and provides the essential base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with a background in the humanities and social sciences.

A minimum of 132 semester hours is required to qualify for the degree, and certain curricula require more. However, students are encouraged to elect course work beyond the required minimum.

Degrees are offered in civil engineering, computer engineering, computer science, electrical engineering, mechanical engineering, and systems analysis and engineering. Students in mechanical engineering may select options in computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering. Electrical engineering provides an option in premedical engineering. Computer science majors must select one of the following application elective tracks: computer-aided design, digital electronics and hardware, engineering administration, financial systems, management decision systems, management information systems, mathematics, and operations research. Systems analysis and engineering majors must choose an elective track from one of the following areas: computer systems, control and instrumentation systems, electrical energy systems, electromechanical systems, environmental systems, financial systems, management decision systems, mathematical systems, mechanical energy systems, network systems, naval systems, production systems, and statistical systems.

## Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students helps them to understand the social and humanistic elements of the past and present and to analyze problems facing the world today. Through these studies, the student gains a better understanding of society and an appreciation of the engineer's role and responsibilities.

Since the engineering curricula are, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should consist of



courses that broaden the student's outlook. Courses in subjects such as accounting, finance, industrial management, and personnel administration should not be included. On the other hand, courses in areas such as anthropology, economics, foreign languages, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

With the assistance of his or her faculty adviser, each undergraduate engineering student is required to prepare a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours, of which at least two courses (6 semester hours) must form a sequence within one subject area. It must also contain courses selected from *both* the humanities and social sciences and not be confined to one or the other. Both the adviser and the department chair must approve the program.

### Computing and Laboratory Facilities and Research Opportunities

The computing facilities and laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged to complement each other.

The learning experience is more meaningful when coupled with research activities. Students may involve themselves in various kinds of research in progress at SEAS—research in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Facility provides technical and operational assistance to users from 8 a.m. to midnight, Monday through Thursday; 8 a.m. to 7 p.m., Friday; 10 a.m. to 6 p.m., Saturday; and 11 a.m. to 8 p.m., Sunday. The facility includes a network of Apple Talk Macintosh microcomputers, two AT&T 3B2 Unix System V computers, three Sun microcomputer engineering workstation networks, a DEC VAX 11/780 super minicomputer system for general engineering research and instructional computing, and a graphics laboratory with advanced color and high-resolution graphics systems from Apple, Hewlett-Packard, Evans & Sutherland, Raster Technologies, and Sun Microsystems. The DEC VAX 11/780 uses the VMS operating system and supports a wide variety of programming languages, applications, and software.

A generous donation from the Alliant Computer Systems Corporation enabled SEAS to acquire an Alliant FX/8 mini-supercomputer, which provides capabilities in high-speed, high-performance complex problem solving. The Alliant FX/8 system features sophisticated vector and parallel computing and supports instruction and research in areas such as finite element and image analysis. In addition, the SEAS Computing Facility has direct access to NSF net for large-scale supercomputing support, and the SURANET, BITNET, and USENET networks are available for national and international communications.

An IBM 4341 Group II computer system configured for computer-aided design and manufacturing applications was awarded to the School by IBM Corporation. This system includes 16 megabytes of main memory, on-line disk storage, color graphics workstations, communications, time-sharing terminals, and a variety of distributed processors, including personal computers and a



multitasking laboratory system. Extensive software support, including graphics systems for CAD/CAM, three-dimensional interactive graphics packages, packages for computer-aided design of printed-circuit boards, computer-aided engineering design programs, and SQL database support are provided with this system.

A recent donation from the Hewlett-Packard Company has also assisted the School in providing up-to-date computer technology, with an emphasis on Unix-based systems and engineering workstations. The donation included an HP 9000-360SRX CAD Lab network, HP 9000-835SE multi-user system, HP Vectra 386 PC network, and HP 9000-370 and 9000-835 SRX Turbo advanced workstations.

Additional computing facilities are available to students and faculty at the University Computer Center (see page 236) and in the specialized laboratories of SEAS. The specific laboratory facilities available to SEAS students are described below.

*Two General Purpose Electronics Laboratories* for work in basic electronics, digital electronics design, instrumentation, networks, solid-state devices, switching circuits, and advanced electronics design. Each laboratory is fully equipped with state-of-the-art Tektronix oscilloscopes, spectrum analyzers and curve tracers, Keithley digital multimeters, Wavetek and HP function generators, Lambda power supplies, and HP universal counters.

*Computer Science Laboratory* for designing, modeling, and testing logic devices, microprocessors, and software. The lab has twenty-four 68000 series and color flat-screen monitors, ten 80286 computers with 40-megabyte hard drives, development system, software and hardware for developing unique EPAL and PROM configurations, wire wrap tools, unpopulated prototype circuit-card assemblies, and an inventory of standard TTL and CMOS devices.

*Graphics Laboratory* supported by Hewlett-Packard advanced color graphics workstations, a Sun microcomputer network including Macintosh II system workstations, a Raster Technologies One/10 color graphics terminal, Sun Micro-graphics printer, and access to an IBM eight-pen plotter.

*Two Computer-Aided Design Laboratories* supported by the IBM 4341 computing system featuring eight of IBM's high-performance 5080 color graphics systems. These systems are complemented by the full spectrum of IBM engineering and scientific software. System output is available through a combination of graphics printers and plotters, including an IBM 4250 publications-quality graphics printer, a Mitsubishi Shinko color printer, and an IBM 7375 plotter capable of E-size engineering drawings. Microcomputer workstations for computer-aided design are provided through a network of IBM PS/2 model 80 personal computers linked to the IBM 4341.

*Robotics and Computer-Aided Manufacturing Laboratory* equipped with a state-of-the-art AdeptOne manipulator with an integrated vision system and HP force-sensing end effector, an indexing table, and a vibratory bowl feeder.

*Computer-Aided Engineering Laboratory* for VLSI design, supported by a network of Sun series engineering workstations and sophisticated software.

*Artificial Intelligence (AI) Laboratory* featuring four Xerox AI Lisp workstations with a variety of expert systems software, one Sun-3 color and three monochrome workstations with Common Lisp and a full UNIX/C environment, two AT-class machines, and a Macintosh.



*Artificial Intelligence/Software Engineering Laboratory* equipped with AT&T 3B2 Unix System V host computers, with Unix personal computers and graphics terminals serving as workstations and sophisticated software for use in instruction and research.

*Decision Support Systems Laboratory* supported by thirteen Hewlett-Packard Vectra 386 networked personal computers, with a file server, laser printer, input scanner, color graphics printers, an eight-pen plotter, and a Sony overhead projection system for classroom demonstrations of interactive computer applications.

*Human Factors Laboratory* supported by IBM PS/2 computers, statistical packages and graphics software, and various psychometric tests.

*Communications, Microwave, and Laser Laboratory* with state-of-the-art signal-analysis and signal-generation equipment, admittance meters, impedance meters, RX meters, slotted sections, heterodyne detection systems, matched terminations, helium-neon lasers, and fiber-optics emitters and detectors.

*Communications Research Laboratory* outfitted with a PDP 11/44 Computing System.

*Power Systems Laboratory* equipped with fractional-horsepower machinery and instrumentation for experiments in support of the design and analysis of electrical power systems.

*Control Systems Laboratory* for investigating the properties of algorithms and computers when they are used together in open-loop or feedback-loop configurations in different processes. The laboratory also uses mathematical transformations developed on 80386 microprocessors to manipulate temperature, air pressure, servomotor speed, timers, printers, plotters, and A/D and D/A converters.

*Medical Engineering Laboratories* containing equipment for study and research in a variety of neurological areas, such as electroencephalography and sensory-evoked potentials, and for medical data acquisition and analysis.

*Robotics Laboratory* used to investigate the programmability and repeatability of robot movements. The laboratory includes a vision system, 8086-80286-80386-based computers, and three robot arms that have 6 degrees of freedom.

*Combustion Diagnostics Laboratory* with diagnostic equipment using laser scattering concepts and a computer-based data acquisition and analysis system.

*Fluid Mechanics and Hydraulics Laboratories* complete with a 35-foot tilting water flume with self-contained circulatory system, a circulating water tunnel, hydraulic benches, fully instrumented subsonic wind tunnel, and a digitizer for conversion of geomorphic river data into digital data.

*Environmental Engineering Laboratory* with an atomic absorption spectrophotometer for trace metal analysis, a gas chromatograph, a high-pressure liquid chromatograph, and a computerized data system for trace organic analysis.

*Materials Laboratories* with three materials-testing systems having capabilities of 11,000, 22,000, and 110,000 pounds; a Tinius Olsen Universal Testing machine with a 400,000-pound capacity; several torsional fatigue machines; a creep facility; a Charpy impact tester; an Instron torque-thrust test system; and specimen preparation facilities. Analytical equipment includes two Lietz optical metallographs and a scanning electron microscope with energy dispersive X-ray analysis.

*Propulsion Laboratory* equipped with both continuous-flow and blow-down air supply systems for the study of new propulsion techniques.



*Soil Mechanics Laboratory* well equipped for determining the classification, strength, compressibility, and general engineering properties of soils.

*Thermal Sciences and Instrumentation Laboratories* designed to support experiments in the various heat-transfer processes and familiarize students with the latest in mechanical engineering measurement and instrumentation techniques.

*Thin-Film Development Laboratory* capable of depositing coatings of metals or ceramics on substrates of interest.

Arrangements may also be made for use of special equipment at various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.



## Graduate Study

The School of Engineering and Applied Science offers graduate study leading to degrees of Master of Science, Master of Engineering Administration, and Doctor of Science and to the professional degrees of Engineer and Applied Scientist.

In its graduate programs, as in its undergraduate curricula, the School emphasizes the development of knowledge and understanding through concentration on principles and their application rather than through encyclopedic coverage of techniques and specialized detail. Each program is individually designed according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval of his or her adviser, the student may select courses in other departments of the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the Programs of Study and Courses of Instruction section of this *Bulletin*.

## Admission

Admission application forms are available from the School of Engineering and Applied Science. They must be submitted with the specified nonrefundable application fee to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 1 for the spring semester,



May 1 for the first summer session, and June 1 for the second summer session. For international students the following application deadlines apply: no later than June 15 for the fall semester, October 15 for the spring semester, and March 15 for any of the summer sessions.

The applicant must request that each educational institution attended since high school graduation send an official transcript of the student's record directly to the manager of engineering admissions. Although scores on the Graduate Record Examination (GRE) are not required, the applicant who has completed the GRE should request that the scores be sent to the School.

An applicant to the Doctor of Science program must, in addition, arrange for letters of recommendation to be submitted from two faculty members of the institution from which he or she received the master's degree. One of these, if possible, should be from the master's adviser. The letters should be addressed to the appropriate department chair. After submitting the admission application form, the doctoral applicant may schedule personal interviews to discuss his or her qualifications and possibilities for an effective doctoral program.

Normally, graduate students who have been suspended from SEAS must wait at least one year before applying for readmission.

All inquiries and correspondence concerning graduate admission should be directed to the manager of engineering admissions. The applicant will be notified by mail when a decision on admission has been made.

For specific admission requirements, please see individual degree programs.

### English Language Requirements for International Students

All applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL). The results of the test must be sent by the administering institution directly to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The University looks for a minimum TOEFL score of 550 in considering candidates for admission.

Students whose native language is not English and who are newly enrolled in any degree program offered by the Department of Engineering Administration must also take, prior to registration, the GWU English as a Foreign Language placement test administered by the English for International Students program. The results of the test will determine whether the student must complete English as a Foreign Language (EFL) course work before enrolling in other courses.

Students admitted to degree programs in departments other than Engineering Administration will be required to take the GWU English as a Foreign Language placement test if they did not score at least 600 on the TOEFL and 5 out of 6 on the Test of Written English (TWE). The results of this test will determine what level of EFL course work, if any, the student will be required to complete before beginning a full program of study in a SEAS curriculum. Such course work will extend the period of time needed to complete the degree. (See page 185 for additional information on EFL courses.)

Students who score below 425 on TOEFL will not be admitted to the University in full degree status. However, those who meet all of the technical requirements for admission and have outstanding academic records may be admitted on a provisional basis. Such students will have degree status only when they have successfully completed the level of EFL 30 (see page 185) within one calendar year of the date of registration.



Additional information and requirements for international students are outlined on pages 11-12.

### Transfer of Credit

Up to 6 semester hours of credit may be accepted in transfer, when applicable, to meet degree requirements of the School, if approved by the student's adviser and department chair. The credit must have been completed with grades of *A* or *B* at another accredited and recognized institution, at a level of study equivalent to that being pursued at GWU. In addition, the professional and doctoral degree programs require that the credit be earned no more than five years prior to admission to the GWU program, and some departments require that it be earned more recently. Credit applied toward a previous degree may not be transferred.

### Regulations

Regulations regarding registration, fees, and finances are stated on pages 188-93; other University regulations, on pages 204-8.

### Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend all meetings of the courses in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

### Grading System

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his or her control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete that is not removed within one calendar year is automatically changed to an *F*.

The symbol *Z* is assigned when a student is registered for a course that he or she has not attended and for which he or she has done no substantial graded work. The grade of *Z* will not be considered in determining the quality-point index.



**Pass/No Pass Grading System.** SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be applied toward any degree program in SEAS.

**Quality-Point Index.** Scholastic standing is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *F*, no points, for each semester hour for which the student registered. Courses marked *W*, *I*, or *Z* are not considered in determining the index, except that courses marked *I* will be considered when a final grade is recorded. With the exception of courses taken at one of the Consortium universities, grades in courses taken at other institutions are not considered in computing the quality-point index.

### Residence and Continuous Enrollment

All work for the degree must be done in residence unless a special exception is granted by the department chair. In addition, a student in a degree program is expected to be continuously enrolled in the School until the degree is conferred. A student who breaks his or her registration must apply for readmission to the degree program under whatever conditions and regulations are in force at that time. To maintain continuous enrollment, a student may register in one of the following categories.

**Inactive Status or Leave of Absence.** This status is available to students who are (1) awaiting graduation (with all requirements completed), (2) attending classes at another institution (with special approval), (3) temporarily transferred out of the area (e.g., for military TDY), (4) having temporary medical problems, or (5) undertaking cooperative education work assignments.

**Continuous Research.** Students not otherwise enrolled must register for 1 semester hour under this designation to prepare for or take the comprehensive or qualifying examination.

### Master's Degree Programs

The student's program may cover a variety of fields or may concentrate in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department, the student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses. Students whose undergraduate study does not include necessary prerequisites may be required to take additional course work. All master's candidates must also pass a Master's Comprehensive Examination.

Upon admission, the student is assigned an adviser. Programs of study are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of study in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the department chair.

### Admission Requirements

Admission to study toward a master's degree requires an appropriate bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate grades,



GRE scores, and similar data. (Although GRE scores are not required for admission to SEAS, applicants are encouraged to take the examination.)

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to degree candidate status. If such deficiencies are minimal, the applicant may be admitted directly to degree candidate status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he or she is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the master's degree.

For admission requirements of a specific master's program, please see the department concerned under Programs of Study and Courses of Instruction.

### Master's Thesis

The master's thesis, when required, must demonstrate the student's ability to make independent use of the knowledge and discipline of thought acquired through graduate study, to undertake constructive work in a given field, and to communicate the results of the work in writing. Suitable work for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

To register for the thesis course (299), the candidate must submit the thesis area to the appropriate department chair, on the form obtained from the department office and approved by the faculty adviser. At the beginning of the semester of expected graduation, the candidate must submit the thesis title to the dean, on the form available in the department office. While registered in the thesis course sequence 299-300, the student is entitled to the advice of the faculty member under whom the thesis is to be written. Students may consult with their advisers, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the department chair by the date stated in the calendar for the semester in which the candidate enrolls in thesis course 300. In the event a thesis is unfinished on the date specified, the student will be granted an additional semester. If preparation of the thesis extends beyond three semesters, the student must have an extension of time approved, reregister for thesis course 300, and pay tuition as for a repeated course. The overall time limit for earning the degree (see Time Limits, below) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Copies of detailed regulations regarding the form and reproduction of the thesis are available in the department office. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the Helman Library, where the duplicate copies are bound and made available for circulation.

### Optional Master's Program Without a Thesis

With the approval of the department, a student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses.



### Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined once more if approval is given by the examining committee. If the student again fails to complete the examination satisfactorily, graduate status is terminated.

### Scholarship

A student who receives two grades of *F* or three grades below *B* is barred from further enrollment in graduate courses and, ordinarily, will not be readmitted as a degree candidate.

A student may not repeat for credit a course in which he or she has received a grade of *C* or above, unless required to do so by the department chair. A written statement requiring the student to repeat such a course for credit must be submitted to the registrar by the department chair.

### Graduation Requirements

**Program With Thesis.** In addition to 6 semester hours of acceptable thesis, a student must have either (1) 24 semester hours of *B* or better with no more than two grades below *B*, of which only one may be an *F*, or (2) a 3.00 quality-point index for a minimum of 24 semester hours with no more than two grades below *B*, of which only one may be an *F*.

**Nonthesis Option.** A student must have either (1) 33 semester hours of *B* or better with no more than two grades below *B*, of which only one may be an *F*, or (2) a 3.00 quality-point index for a minimum of 33 semester hours with no more than two grades below *B*, of which only one may be an *F*.

### Time Limits

A full-time student in the master's program is allowed a maximum of three calendar years (excluding the time spent taking only English as a Foreign Language courses) to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in the master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair and approved by the dean.

### Professional Degree Program

The School of Engineering and Applied Science has established the professional degree program for those students who wish to pursue course work beyond the master's degree with emphasis on applied subject material rather than on basic



research. The program has been designed to satisfy the needs of industry and government for highly trained technical personnel in engineering and applied science.

The student's program may cover a variety of fields or concentrate in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a master's degree. Students whose graduate study does not include necessary prerequisites may be required to take additional course work.

Successful completion of the professional degree program leads to the degree of Engineer or of Applied Scientist.

### Admission Requirements

Admission to study toward the professional degree requires an appropriate master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience. The Department of Electrical Engineering and Computer Science requires applicants for the professional degree program to have had two years of professional experience after receiving the master's degree.

**Engineer.** To study toward the degree of Engineer, an applicant must possess a master's degree and a bachelor's degree in an area of engineering.

**Applied Scientist.** To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in engineering, mathematics, or natural science and a master's degree in engineering, natural science, mathematics, or administration. Applicants who have an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure acceptance; the departments may, and often do, set higher admission standards.

For admission requirements of a specific professional degree program, please see the department concerned under Programs of Study and Courses of Instruction.

### Program of Study

Upon admission, the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of each professional degree candidate must be approved by the student's adviser and the department chair.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses as an unclassified student before being admitted to degree candidate status. In no case may courses thus taken fulfill any part of the requirements for the professional degree.

Each department may require its degree candidates to undertake and defend the results of a technical design project or a development problem or to prepare a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of thought acquired through graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated. In no case, however, will this project be more than 6 semester hours of the minimum 30.



### Scholarship

If a student studying for the professional degree receives two grades of *F* or three grades below *B*, study is terminated and further enrollment prohibited. A student must have a final quality-point index of 3.00 to receive the degree.

### Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair.

### Relationship with the Doctoral Program

Candidates for the Doctor of Science degree or professional degree who are in good academic standing may, with the approval of the faculty adviser and department chair, transfer from one degree program to the other within their department if they meet the qualifications and requirements specified by the department.

### Doctor of Science Degree Program

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. The program is divided into two stages. The first—made up of a study of related fields of learning that support the general area of research concentration—culminates in the qualifying examination. The second—composed of original research and the presentation of findings in a written dissertation—culminates in the final examination.

### Admission Requirements

Admission to study toward a doctoral degree requires an appropriate master's degree from an accredited institution together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure acceptance; the departments may, and often do, set higher admission standards.

For admission requirements of a specific Doctor of Science degree program, please see the department concerned under Programs of Study and Courses of Instruction.

### Language Requirement

Since the doctoral program emphasizes the importance of scientific and technical contributions originating from other countries, some areas of study demand the ability to read appropriate literature in a foreign language. Therefore, departments have the option of requiring reading knowledge of such a language.



### Tool Requirement

In addition to or in lieu of the language requirement, an examination in a tool requirement (for example, computer programming) may be established by the department.

### Study for the Qualifying Examination

Upon admission to the first stage of the program (that is, study of related fields culminating in the qualifying examination), the student is assigned a faculty adviser who directs his or her studies. The adviser approves appropriate fields of study to ensure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of fields of study, and guides preparation for the qualifying examination. In some departments, instead of a single adviser a faculty committee may be appointed to approve programs, direct study, and carry out all other advising responsibilities. Programs of study are normally structured to include a major field and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond master's study is required. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the master's degree was obtained, the program of study exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

### The Qualifying Examination

The qualifying examination is the principal means of determining whether a student will qualify as a candidate for the doctoral degree and progress to the second stage of the program. Its purpose is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. (Some departments may administer a prequalifying examination prior to completion of the study program.)

Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters, on dates established by the departments, and are administered by a faculty committee. Upon favorable report of the examiners to the dean through the department chair, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer or scientist who is not a member of the faculty.

At the discretion of the committee that prepared the examination, a student who fails any part of the qualifying examination may be given a second opportunity to qualify for candidacy. Usually, the entire examination must be taken.

Students who fail to qualify for candidacy in a doctoral program of the School will be considered to have failed on a school-wide basis and will not be admitted to further doctoral study within the School.



### Scholarship

To be admitted to the qualifying examination, the student must have an overall quality-point index of 3.20. If a doctoral student receives two grades of *F* or three grades below *B*, graduate study is terminated and further enrollment prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. Students who receive any grade below *B* are required to review their programs of study with their advisers and discuss possible changes.

### Research, Dissertation, and Final Examination

The student admitted to candidacy for the degree of Doctor of Science chooses the faculty member under whom he or she wishes to conduct research; the faculty member may accept or reject the request to serve as the student's director of research. The research area is approved by the director and throughout the remainder of the doctoral program the candidate conducts dissertation research under the director. However, the student may consult other members of the faculty as required, on an informal basis, and may be encouraged to do so by the director of research. A committee of the faculty, consisting of three members and including the director as chair, will advise in final preparation of the dissertation. The department chair appoints this committee on the recommendation of the director of research. Work on the dissertation is equivalent to a minimum of 24 semester hours.

**The Dissertation.** A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The dissertation should embody the results of an extended original study and include material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to have the results of the research published as soon as possible after he or she receives the degree and to submit copies of the published material to the dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, or developed from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the department five complete copies of the dissertation and an abstract (not to exceed 350 words) no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in department offices. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover part of the expense of printing the abstract and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the Gelman Library, where bound copies are available for circulation.

**The Final Examination.** Upon acceptance of the dissertation by the research committee, the candidate is presented for the final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special field of study and of the materials and techniques used in the research. The committee of examiners will consist of at least five members, three of whom must be full-time faculty members. The committee



may include qualified experts brought to the University especially to participate in the examination. The director of research serves as advocate for the candidate. When the examining committee is convinced of the high quality and originality of the candidate's contribution to knowledge as well as his or her mastery of the scholarship and research techniques of the field, the committee recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult the department chair about scheduling the examination.

### Enrollment Requirements

Full-time doctoral students must register for a minimum of 12 hours per semester until 24 hours of work have been completed beyond the qualifying examination and one hour of dissertation research (course number 399) each semester thereafter until satisfactory completion of the final examination.

Part-time doctoral students must register for a minimum of 6 hours per semester until 24 hours of work have been completed beyond the qualifying examination and one hour of dissertation research (course number 399) each semester thereafter until satisfactory completion of the final examination.

No minimum load is required during the summer sessions.

### Time Limits

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination, although the student may apply for the examination whenever he or she feels properly prepared. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must usually be completed within seven years. (Full-time students in the doctoral program in engineering administration are allowed a maximum of five calendar years to complete all degree requirements.) A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree. The time period for completion of the degree will be adjusted for an approved leave of absence.



## **Research Institutes**

### **Institute for the Study of Fatigue, Fracture, and Structural Reliability**

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation among research workers from different fields. The institute deals primarily with the study of the physical mechanism of damage initiation in order both to establish principles for the design of metal alloys of superior fatigue performance and to develop advanced methods of fatigue design and reliability. Because much straight fatigue testing of standard test specimens is and has been done by industrial, government, and university laboratories, no testing of this type is generally conducted by the institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the institute. In addition to advancing interdisciplinary research, the institute provides specialized training for graduate students.

The institute conducts seminars, issues technical reports, and provides information, lectures, and consultations to many government and industrial research and development laboratories.

### **Institute for Management Science and Engineering**

The Institute for Management Science and Engineering defines and develops new analytical management techniques to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for graduate teaching, research, and public service in fields such as operations research, mathematics, statistics, economics, and computer science.

The programs of the institute are concerned with conservation of national resources. Through its Program in Logistics, the institute performs research focused on developing a science of logistics with principles and methodology for resource allocation in civil affairs and national defense. Other programs involve optimization, reliability, queuing, forecasting, and cost-benefit analyses.

The institute encourages participation by faculty members and graduate students from all schools in the University. Qualified graduate students may apply for research assistantships, which ordinarily support thesis and dissertation efforts. The programs of the institute also rely on staff research specialists, and there are special provisions for inviting distinguished visitors from government, private industry, and other universities.

The institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

### **Institute for Reliability and Risk Analysis**

The Institute for Reliability and Risk Analysis (IRRA) promotes basic and applied research in the mathematical and statistical aspects of reliability theory, risk analysis, quality control, and industrial statistics. The work of the IRRA involves University faculty, visiting professors and scholars, scientists from government and industry, and doctoral-level graduate students.



Visiting professors and qualified graduate students may be supported through research grants, scholarships, and fellowships. The major effort of graduate students is in research toward the doctoral dissertation. In the past, major support for research at IRRA has come from the U.S. Army Research Office, the Office of Naval Research, the U.S. Nuclear Regulatory Commission, the Los Alamos Scientific Research Laboratories, and the U.S. Naval Air Systems Command as well as private industry, such as the Association of American Railroads, Ketron, and General Motors Corporation.

IRRA sponsors seminars and colloquia, featuring distinguished scientists, for the general public and the University community and issues technical papers and research reports to disseminate research results.

### International Water Resources Institute

The International Water Resources Institute was created to foster a multidisciplinary approach to planning, developing, and operating water resources systems and solving water resources problems on both the national and international levels.

The institute emphasizes basic and applied research, technical development, transfer of knowledge, professional and scientific services, and special educational needs. It conducts seminars and supplies information to government agencies and private concerns in the United States and abroad, creating an international flow of knowledge about water resources problems and their possible solutions.

### Institute for Information Science and Technology

The Institute for Information Science and Technology was created by the Department of Electrical Engineering and Computer Science to provide a framework for research, facilitate cooperation, and share resources in the areas of telecommunications, data networks, signal processing, control theory, and design; computer architecture, graphics, and languages; and artificial intelligence and robotics. The institute is operated by a core staff and faculty researchers from George Washington University. In addition, visiting scholars and fellows from government and industry fill research positions while pursuing advanced studies. The institute produces research publications, grant contract reports, and scholarly papers; sets up system design and development demonstrations; and sponsors continuing education programs, seminars, and conferences.

Because the rapid pace of technological innovation demands that universities and industry work closely together, the **Industrial Liaison Program** has been established to foster cooperation and communication between the Department of Electrical Engineering and Computer Science, the Institute for Information Science and Technology, and companies that depend on the fields represented by the department. The ILP offers participating companies a research center with which employees can interact and closer ties with university faculty and students. For the department, the ILP provides a way to gain a better understanding of the needs of industry, so that research and teaching can be made more relevant; to disseminate research results quickly to those who can benefit from their application; and to secure the resources needed to strengthen research facilities and programs. Funds made available through the Industrial



Liaison Program also provide fellowships and assistantships for graduate students.

### **Institute for Artificial Intelligence**

The Institute for Artificial Intelligence (IAI) was formed to unite, strengthen, and extend ongoing activities at the University. In particular, the IAI pursues an interdisciplinary approach to the research, development, testing, and evaluation of artificial intelligence aids to human endeavor in engineering and science, in manufacturing and industrial operations, and in policy and decision making. Ongoing research projects include cognitive modeling, intelligent interfaces, expert systems, computer-aided manufacturing, and automatic programming.

### **Institute for Technology and Strategic Research**

The Institute for Technology and Strategic Research (ITSR) has been established as a university-based technical organization to provide unbiased assessments of technological innovations in light of national security goals. The institute facilitates research on the mid- to long-term relationships between technology and national security requirements; presents timely and original analyses of matters related to key national decisions; and sponsors relevant seminars, workshops, and colloquia. It encourages public discussion and promotes cooperation among government, academia, and industry.

Since an important objective of ITSR is to increase understanding of the interdependence of science, technology, and international security and of the technological challenges that will shape the future international environment, the institute's programs are conducted in close cooperation with GWU's School of International Affairs and with the participation of the Columbian College of Arts and Sciences, Graduate School of Arts and Science, National Law Center, and School of Government and Business Administration.

### **Institute for Medical Imaging and Image Analysis**

A collaborative effort of the SEAS Department of Electrical Engineering and Computer Science and the Department of Radiology of the School of Medicine and Health Sciences, the Institute for Medical Imaging and Image Analysis conducts research into all aspects of this field, including image generation, transmission, display, evaluation, enhancement, and interpretation. Current projects, for example, involve the design and implementation of digital imaging networks and their workstations, coding and archiving of images, tissue characterization, and three-dimensional representations. The results of this research are disseminated through colloquia, technical reports, and research papers and are applied in both clinical and technological settings: for teaching and diagnosis and for the development of software and hardware that will provide better and more useful images.

Faculty from both departments, clinicians in radiology, visiting professors and scholars, and doctoral students participate in the work of the institute and regularly exchange ideas with scientists from government and industry. The institute's research is supported by funds from the federal government, medical and trade associations, and private industry.



## Center for High Technology

The Center for High Technology was established to encourage multidisciplinary educational programs, interdepartmental research, and joint ventures with industry and government aimed at improving productivity in large-scale systems and software engineering programs. The center has four primary research objectives: to create computer-based systems engineering tools that will increase the productivity of designers and developers of large-scale systems; to develop computer-based tools that will enable software engineering activities to be carried out more productively; to integrate systems and software engineering tools; and to apply computer-based tools to actual problems of government and industry and transfer the technology developed to users in these sectors. The center sponsors seminars, colloquia, lectures, and short courses, and graduate students are encouraged to participate in its research activities.

## GWU/NASA-Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 1971 through the combined efforts of the National Aeronautics and Space Administration's Langley Research Center and the George Washington University's School of Engineering and Applied Science. The institute, located at the Langley Research Center in Hampton, Virginia, is dedicated to the advanced training of students and professional engineers in aeroacoustics, aeronautics, astronautics, and related areas. It also serves as a center for advanced research in these areas providing facilities for qualified researchers and scholars. Richard W. Barnhill, Chief Scientist, NASA-Langley Research Center, is director of the institute and Harold Liebowitz, Dean of the School of Engineering and Applied Science, is codirector.

The JIAFS offers students closely related instruction and research opportunities that draw on the academic resources of the University, the professional research facilities of the NASA-Langley Research Center, and the expertise of visiting scholars and researchers. Current programs are described below.

**Aeroacoustics Program.** This program is concerned with the problems of radiating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise-resistant structures, and ground transportation systems. Areas of research include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, structural response to noise, and mechanical and acoustical coupling problems.

**Aeronautics Program.** This program deals with advanced flight concepts for various aircraft, including aerodynamics, performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Areas currently being investigated include aerodynamic analysis of jet aircraft, wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, stall characteristics of aircraft, computational fluid dynamics, and experimental simulation of aircraft handling characteristics.

**Astronautics Program.** This program is concerned with the problems associated with flight and existence in space. Research areas include advanced propulsion systems, conceptual design of launch vehicles and spacecraft, control of space structures, and characteristics of hypersonic flight.



Graduate Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA-Langley, and visiting scientists and engineers participate in these programs.

A number of Research Scholar Assistantships are available to qualified students pursuing Master of Science and Doctor of Science degrees in the fields of aeroacoustics, aeronautics, and astronautics. Research Scholar Assistants receive full tuition remission and stipends of \$12,000 a year for master's degree candidates and \$15,000 a year for doctoral students. Application forms, a JIAFS brochure, and additional information may be obtained from Professor John L. Whitesides, JIAFS-George Washington University, Mail Stop 269, NASA-Langley Research Center, Hampton, Va. 23665-5225.

### GWU/NASA-Langley Graduate Program

George Washington University, in cooperation with the Langley Research Center, offers a graduate engineering program at NASA-Langley. The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA-Langley's extensive scientific and engineering facilities are used whenever possible.

The program at NASA-Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chair) and to the professional degree of Engineer in the fields of aeroacoustics, astronautics, astronautics, fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, and engineering administration (M.E.A. only).

Information regarding this program may be obtained from Professor John L. Whitesides, GWU/NASA Program, Mail Stop 269, NASA-Langley Research Center, Hampton, Va. 23665-5225.



## Continuing Engineering Education Program

The School of Engineering and Applied Science offers a comprehensive program of noncredit courses designed to enhance the competence of practicing engineers. The Continuing Engineering Education Program provides both review courses and the latest information in the engineering, scientific, and engineering administration fields. It enables engineers to keep pace with the rapid advances in scientific and technological knowledge, expand their areas of expertise, and acquire additional skills necessary for professional certification or promotion.

The program presents more than 500 noncredit short courses annually. All courses emphasize practical applications. The presentation of theory is often augmented by workshops to give participants actual experience in a specific discipline. New courses are continuously being developed and older courses revised and updated. In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, industry, and government laboratories and agencies serve on the instructional staff of the program. The majority of courses are presented on the George Washington University campus in Washington, D.C. Courses are also routinely scheduled for presentation throughout the United States, Canada, and Europe.

The program also offers noncredit courses presented on-site for organizations. The content of an on-site seminar can be tailored to the training needs of the sponsoring organization, and the teaching schedule can be adjusted to fit the organization's requirements. Tuition for sponsored courses is usually appreciably lower than advertised courses.

The Continuing Engineering Education Program offers courses in the following fields:

- Aerospace and aeronautical engineering
- Civil engineering, transportation, and construction
- Computer and information management sciences
- Communications engineering
- Electrical and electronic engineering
- Energy and environmental systems engineering
- Engineering management
- Geotechnical engineering
- Industrial engineering
- Mechanical engineering
- Medical engineering
- Nuclear engineering
- Quality assurance
- Statistics, reliability, and operations research

To receive announcements or additional information, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202)994-6106 (800)424-9773 in the United States, (800)535-4567 in Canada.



## Special Programs for Undergraduates

### Cooperative Education Program in Engineering

Cooperative education is a process that formally integrates academic study with work experience in cooperating employer organizations. Usually, students alternate periods of college study with periods of experience in appropriate fields of industry and government, which are considered an integral part of the student's education. Through the interaction of study and work, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing supervisors share in the educational process of the cooperative education student.

Cooperative education students in a work assignment are considered full-time students for purposes of housing and campus privileges. They are not considered as full-time students for Veterans Administration benefits, financial aid, or visa purposes. The wages received as compensation for work performed under the Cooperative Education Program are taxable income per Section 61 of the IRS Code.

#### Advantages of Cooperative Education

**Combines Theory and Practice.** By coordinating work experience with campus education, students integrate theory and practice and find greater relevance in their studies. Alternating between academic and industrial environments helps students to understand the role and meaning of each, with a deeper appreciation for both.

**Helps Finance Educational and Living Expenses.** Students' earnings contribute substantially to financing their education and living expenses. Work assignments usually increase in difficulty and responsibility as students progress through the academic curriculum, and salaries increase accordingly.

**Serves as a Bridge to the Future.** Cooperative education helps to orient students to the world of work, enabling them to learn more about the range of occupations open to them and the qualifications demanded. Cooperative education programs provide opportunities for students to explore their abilities in connection with real jobs and to gain firsthand information about the occupations in which they are employed and a number of related fields. They have a chance to test their aptitudes more fully than is normally possible on campus.

**Increases Motivation to Achieve.** The coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, they develop greater interest in academic work. Work assignments often help students to develop good work habits because their efforts are rated by the employer.

**Enhances Human Relationships.** Because the work experiences often require constructive relationships with coworkers who come from a variety of backgrounds, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

**Develops Maturity.** For many students the work experience contributes to an increased sense of responsibility for their own efforts, greater dependence on their own judgment, and a corresponding development of maturity.

#### Why Employers Participate

Industry and government agencies have found that cooperative education students are valuable employees. Generally, they are alert and energetic young



people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of well-trained personnel. The training period provides an opportunity for the employer to evaluate the student as a prospective permanent employee. At the same time, the student is able to evaluate the employer in terms of his or her interests and future plans. About half of the cooperative education graduates remain in permanent positions with their employers after graduation, giving them a substantial head start in their careers.

It is emphasized, however, that the employer is not obligated to offer permanent employment after graduation, nor is the student obliged to accept. Industry and government agencies consider participation in cooperative education to be a long-range investment, a joint effort with the University to develop students' talents more fully.

### Responsibilities of the Cooperative Education Student

The cooperative education student working with professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's performance to the Cooperative Education Program coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative education student must maintain continuous enrollment in the School for each semester he or she is on a work period. Failure to do so weakens the student's registration, and he or she must apply for readmission to the undergraduate degree program under whatever conditions and regulations are in force at that time.

### Scholastic Requirements

Students entering the program must be in good academic standing and usually must have completed at least two semesters of college-level academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

### Living Accommodations

Arrangements are made for students in the Cooperative Education Program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they also retain full student privileges and have access to all University facilities.

### Work-Study Schedules

Student schedules are arranged individually with employers in Washington and other areas, since each employer operates differently. The schedule must be mutually satisfactory to the student, the employer, and the School.



Generally, the schedule is arranged after the student has successfully completed the first year of study. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. In the third and fourth years, students alternate between employer and classroom each semester, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual basis according to the number of semester hours transferred and the employer's requirements.

### Tuition Aid

Under the Tuition Aid Program, certain employers grant up to 50 percent of the cost of tuition, textbooks, and fees (excluding room and board). A student who receives tuition assistance must agree to serve as an employee after graduation for a period to be determined by regulations in force at that time.

The cooperative education student who is a civil service employee is eligible for many federal benefits, including annual leave, sick leave, paid holidays, health benefits, and life insurance.

### Applications

Applications for the Cooperative Education Program from registered or transfer students should be submitted at least 10 weeks prior to the beginning of the first work period. It is recommended, however, that applications be submitted four months in advance of the work period. Transfer students who meet admission requirements may apply for work assignments during the summer or the semester just prior to their registration at this University.

### Honors Research Program

To provide individualized research experience to academically gifted undergraduate students, the School of Engineering and Applied Science has established an Honors Research Program. A student who maintains a grade-point average of 3.3 or above or is admitted to the School with a combined SAT score of 1250 and a rank in the upper 10 percent of his or her high school class is eligible for this program. Participants attend an honors research seminar and each works individually with a faculty member, performing a research project of mutual interest. Participation in the program earns 3 academic credits per semester; a minimum of 9 credits is needed to complete the program. Upon written request by the student, 6 of these credits may be used as technical electives.

In the honors seminar, students present the results of their research projects and discuss techniques applicable to research in many disciplines, as well as conditions and trends that influence the performance and application of research in universities, industry, and government laboratories. The projects, which emphasize original research, typically involve literature surveys, analytical and numerical studies, and the planning and execution of experiments. Students are expected to prepare written and oral reports on their research.

Qualified students interested in applying for the program should contact the honors research chairman of the department in which the research is to be conducted.



## Naval Reserve Officers Training Corps Program\*

The Naval Reserve Officers Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science courses and attend weekly laboratory sessions. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as lieutenants in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

**Four-Year Scholarship Program.** Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While students are enrolled, the government provides tuition, fees, books, uniforms, and an allowance of \$100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation and will serve on active duty for at least four years. Students must include courses in English, calculus, computer science, physics, national security policy, a foreign language, technical electives, and naval science in their degree programs and participate in three summer training periods of approximately four weeks each.

**Two-Year Scholarship Program.** Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made by the start of the first semester of the student's sophomore year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and drill, similar to those required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

Entering freshmen and transfer students who are awarded NROTC scholarships and plan to live on campus may also be eligible for GWU Residence Hall awards from the University. NROTC scholars with prior experience in the Navy are eligible for awards covering the average charges for on-campus housing and meals. NROTC scholars who are new to the Navy and are majoring in mathematics, chemistry, physics, or a program in the School of Engineering and Applied Science may receive \$4,000 to be applied toward the costs of on-campus housing and meals. Further information on these awards is available from the University Office of Admissions.

**Four-Year College Program.** Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive an allowance of \$100 per month. Students must include courses in mathematics, science, and naval science in their degree programs, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps upon graduation with an eight-year active/reserve service obligation, and

\*Army and Air Force ROTC program information, see page 211.



serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record, and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training. College Program students who demonstrate academic excellence may be nominated for NROTC Scholarships by the Professor of Naval Science. If awarded, the scholarship will be for the remainder of the student's undergraduate enrollment, up to a maximum of three and a half years; service requirements and benefits are the same as for the scholarship programs.

**Two-Year College Program.** Application should be made by the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion may enroll in the program. The benefits and obligations are the same as those for the Four-Year College Program.

**Requirements for All Candidates.** Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science.

### Naval Science Courses

#### 51 Introduction to Naval Science (3)

A general introduction to the naval profession and to concepts of sea power. The mission, organization, and warfare components of the U.S. Navy and Marine Corps. Overview of officer and enlisted ranks and rates, training and education, and career patterns. Naval courtesy and customs, military justice, leadership, and nomenclature. Professional competencies required to become a naval officer.

#### 52 Naval Ships Systems I (Engineering) (3)

A detailed study of ship characteristics and types, including ship design and control, propulsion, hydrodynamic forces, stability, compartmentation, electrical and auxiliary systems, interior communication, and damage control. Included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting.

#### 125 Naval Ships Systems II (Weapons) (3)

Theory and employment of weapons systems, including the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types, including capabilities and limitations. Physical aspects of radar and underwater sound. Facets of command, control, and communications as means of weapons system integration.

#### 126 Sea Power and Maritime Affairs (3)

A survey of U.S. naval history, from the American Revolution to the present, with emphasis on major developments. The geopolitical theory of Mahan. Present-day concerns in sea power and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of U.S. and Soviet naval strategies.

#### 150 Navigation and Naval Operations I (3)

An in-depth study of piloting and celestial navigation, including theory, principles, and procedures. Students develop practical skills in both piloting and



celestial navigation. The use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. The celestial coordinate system; spherical trigonometry, theory and operation of the sextant, and a step-by-step treatment of the sight-reduction process. Other topics include tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and a day's work in navigation.

151 **Navigation and Naval Operations II (3)**

A study of the international and inland rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

160 **Evolution of Warfare (3)**

This course traces the development of warfare, from the dawn of recorded history to the present, with focus on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires a basic sense of strategy, develops an understanding of military alternatives, and sees the impact of historical precedent on military thought and actions.

175 **Leadership and Management I (3)**

A comprehensive study of organizational behavior and management in the context of naval organization. Survey of the management functions of planning, organizing, and controlling. Introduction to individual and group behavior in organizations and extensive study of motivation and leadership. Major behavioral theories. Practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics include decision making, communication, responsibility, authority, and accountability.

176 **Leadership and Management II (3)**

A survey of the interaction of leadership, organizational behavior, and human resource management. Employee interviewing and counseling, performance appraisals, business correspondence, military and civilian law, and managerial ethics and values. This capstone course in the naval science curriculum builds on and integrates professional competencies to develop a thorough understanding of the problems and issues faced by leaders, managers, and naval officers.

180 **Amphibious Warfare (3)**

A historical survey of the development of amphibious doctrine and the conduct of amphibious operations. The evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

### Naval Science Course Credit

Students enrolled in undergraduate degree programs in the School of Engineering and Applied Science are eligible to receive technical elective credit for the successful completion of certain naval science courses.

Naval Engineering, Computer Science, and Mechanical Engineering majors—

NSc 52: Naval Ships Systems I

NSc 150: Navigation and Naval Operations I

NSc 175: Leadership and Management I

Computer Engineering and Electrical Engineering majors—

NSc 52: Naval Ships Systems I

NSc 150: Navigation and Naval Operations I

Systems Analysis and Engineering majors—

NSc 52: Naval Ships Systems I

NSc 125: Naval Ships Systems II

NSc 150: Navigation and Naval Operations I

NSc 151: Navigation and Naval Operations II



Social science credit may be received for the successful completion of the following naval science courses. (See the *Undergraduate and Graduate Programs Bulletin* for further information.)

NSc 126: Sea Power and Maritime Affairs

NSc 160: Evolution of Warfare

NSc 180: Amphibious Warfare

### Secondary Fields of Study

A program of secondary fields of study has been established within the University to provide opportunities for formal inter-school study. Students must be in good academic standing in the school in which they are enrolled to be eligible to take a secondary field in another school. The secondary fields consist of 12 to 30 hours of prescribed courses, depending on the field, with scholarship requirements determined by the school offering the field. Upon satisfactory completion of all requirements, the title of the secondary field of study and the courses taken in support of the field are entered on the student's transcript.

Students enrolled in degree programs in the School of Engineering and Applied Science may not take secondary fields within SEAS. For information on the secondary fields offered by other schools, which are open to SEAS students, please see the program brochure available in the SEAS Admissions Office. Because the undergraduate engineering degree programs are highly structured, SEAS students are cautioned to consult their adviser and department chair before enrolling in a secondary field of study.

### 3:2 Dual-Degree Programs Combining Liberal Arts and Engineering

The School of Engineering and Applied Science has developed 3:2 dual-degree programs in liberal arts and engineering with the following accredited institutions:

Bowie State College, Bowie, Md.

Chestnut Hill College, Philadelphia, Pa.

Gallaudet University, Washington, D.C.

Georgian Court College, Lakewood, N.J.

Hood College, Frederick, Md.

Mansfield State University, Mansfield, Pa.

St. Joseph College, Hartford, Conn.

St. Mary's College of Maryland, St. Mary's City, Md.

St. Thomas Aquinas College, Sparkhill, N.Y.

Southeastern College, Athens, Greece

Virginia Commonwealth University, Richmond, Va.

Wheaton College, Norton, Mass.

Students initially enroll in the 3:2 dual-degree program at one of the above institutions and pursue a three-year course of studies covering social sciences, humanities, mathematics, physics, and chemistry, which helps the student develop broad cultural perspectives, analytic abilities, and communication skills. Students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of study, students



may specialize in any of the areas of engineering offered in the School's regular four-year programs.

Upon successful completion of the two-year engineering program at George Washington University, students are awarded two baccalaureate degrees: a B.S. in engineering or computer science from the first institution and a B.S. in engineering or computer science from GWU. Program graduates may choose to enter engineering practice, continue studies for advanced degrees, or enter other professional areas, such as law, medicine, or teaching.

Students in a dual-degree program are eligible to apply for the Cooperative Education Program in Engineering at George Washington University. The student transferring to GWU is considered to have completed the equivalent of the first two years of the engineering curriculum. Thus the student would have the option of working during the summer and starting classes in the fall or working for a full eight months prior to starting classes. Those interested in applying for cooperative education at GWU should submit the appropriate application forms six months prior to actual transfer.

For further information on the 3:2 dual-degree programs, contact the admissions offices of the institutions listed above.



## Administration

- Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science; Codirector, Joint Institute for Advancement of Flight Sciences; Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability; Director, Institute for Technology and Strategic Research; Director, Center for High Technology*
- James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*
- James David Foley, Ph.D., *Chair of the Department of Electrical Engineering and Computer Science*
- Raymond Richard Fox, M.S., *Chair of the Department of Civil, Mechanical, and Environmental Engineering*
- Ali Muhlis Kiper, Ph.D., *Mechanical Engineering Curriculum Chair, Department of Civil, Mechanical, and Environmental Engineering*
- Homer Belk Sewell, Ph.D., *Chair of the Department of Engineering Administration*
- Richard Martin Soland, Ph.D., *Chair of the Department of Operations Research*
- Robert Mayer Allman, M.D., *Codirector, Institute for Medical Imaging and Image Analysis*
- Walter Kurt Kahn, D.E.E., *Director, Institute for Information Science and Technology*
- Murray Howard Loew, Ph.D., *Codirector, Institute for Medical Imaging and Image Analysis*
- Khalid Mahmood, Ph.D., *Director, International Water Resources Institute*
- William Henry Marlow, Ph.D., *Director, Institute for Management Science and Engineering*
- Barry George Silverman, Ph.D., *Director, Institute for Artificial Intelligence*
- Nozer Darabsha Singpurwalla, Ph.D., *Director, Institute for Reliability and Risk Analysis*
- Edward Teller, Ph.D., *Honorary Director, Institute for Technology and Strategic Research*
- Richard Walker Barnwell, Ph.D., *Chief Scientist, NASA-Langley Research Center; Director, Joint Institute for Advancement of Flight Sciences*
- John Lindsey Whitesides, Jr., Ph.D., *Associate Director and Director of Research, Joint Institute for Advancement of Flight Sciences*
- Margaret Mary Hansen, B.A., *School Administrator*
- Graham Wilson McIntyre, M.S., *Director, Research and Resources Office*
- J.W. Perkins, B.S., *Director, Continuing Engineering Education Program*
- Michael Paul White, B.A., *Manager, SEAS Computing Facility*

## Dean's Council

- Harold Liebowitz (*Chairman*), S.Y. Berkovich, R.R. Fox, C.A. Garriss



## Advisory Council

The purposes of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the larger community; and to generate support for the continued development of the School and its programs.

### Members of the Council for 1989-90\*

**Chairman:** L. Stanley Crane, *Vice Chairman of the Board of Trustees of The George Washington University*  
Bruno A. Boley, *Professor of Civil Engineering and Engineering Mechanics, Columbia University*  
J.P. Chambers, *Consultant, E-Systems, Inc.*  
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Wayne G. Shaffer, *Consultant, Vitro Laboratories*  
Edward G. Uhl, *Trappe, Maryland*  
Ernst Weber, *President Emeritus, Polytechnic Institute of New York*  
Harold A. Wheeler, *Chief Scientist and Chairman Emeritus, Hazeltine Corporation*  
L.A. Zadeh, *Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley*

\*The president of the University, the vice president for academic affairs, and the dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council.



## Programs of Study and Courses of Instruction

Programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science are described in this section.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of Continuing Education.

### Explanation of Course Numbers

Courses numbered 1-200 are planned for undergraduate students, although certain courses may be taken for graduate credit when approved in advance by the instructor and the dean. Courses numbered 201-300 are planned for graduate students and may in certain instances be taken by qualified undergraduate students. Courses numbered 301-400 are primarily for doctoral students.

### Semester Hours of Credit

The number of semester hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. A year-long course giving three hours of credit each semester is marked (3-3) and a semester course giving three hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

### Time of Course Offerings

Following each course description is a parenthetical statement listing the semester for which the course is scheduled. The term *academic year* is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Summer sessions offerings are generally not designated in this *Bulletin*. Students should consult the *Summer Sessions Announcement* for summer offerings. A *Schedule of Classes* is published each semester to provide information concerning the time of course offerings.

### Computer Usage Fee

A computer usage fee is charged for those courses that use the computer facilities of the University. Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is \$100 for any semester.

### Key to Abbreviations

The following abbreviations are used for course designations.

Accy	Accountancy	Anat	Anatomy
AdSc	Administrative Sciences	Anes	Anesthesiology
AHA	Allied Health Administration	Anth	Anthropology
AM	Association Management	ApSc	Applied Science
AmCv	American Civilization	Art	Art



ArTh	Art Therapy	ME	Mechanical Engineering
BAd	Business Administration	Med	Medicine
Bioc	Biochemistry	Mgt	Management Science
BiSc	Biological Sciences	Micr	Microbiology
CE	Civil Engineering	MStd	Museum Studies
Chem	Chemistry	Mus	Music
Chin	Chinese	Neur	Neurology
Clas	Classics	NSc	Naval Science
CIEn	Clinical Engineering	NSur	Neurological Surgery
Cnsl	Counseling	Ob&G	Obstetrics and Gynecology
Comm	Communication	Opht	Ophthalmology
CpMd	Computer Medicine	OR	Operations Research
CSci	Computer Science	Orth	Orthopedic Surgery
Derm	Dermatology	PAd	Public Administration
EAd	Engineering Administration	Path	Pathology
Econ	Economics	Pchi	Psychiatry and Behavioral Sciences
Educ	Educational Leadership	PCm	Political Communications
EE	Electrical Engineering	Ped	Pediatrics
EFL	English as a Foreign Language	PubH	Public Health
EMed	Emergency Medicine	Phar	Pharmacology
Engl	English	Phil	Philosophy
EngS	Engineering Science	Phyl	Physiology
EnHe	Environmental Health	Phys	Physics
Envr	Environmental Studies	Port	Portuguese
E&RP	Environmental and Resource Policy	PPol	Public Policy
ExSA	Exercise and Sport Activities	PSc	Political Science
ForS	Forensic Sciences	Psyc	Psychology
Fren	French	Rad	Radiology
Geog	Geography and Regional Science	Rel	Religion
Geol	Geology	Rmn	Romanian
Ger	Germanic Languages and Literatures	Rom	Romance Literatures
Gern	Gerontology	RSci	Radiological Sciences
Gnet	Genetics	Slav	Slavic Languages and Literatures
HCS	Health Care Sciences	SLP	Service Learning Program
Hist	History	Soc	Sociology
HmKn	Human Kinetics	Span	Spanish
Hmn	Humanities	SpEd	Special Education
HmSr	Human Services	SpHr	Speech and Hearing
HRD	Human Resource Development	Stat	Statistics/Computer and Information Systems
HSA	Health Services Administration	Surg	Surgery
IAff	International Affairs	TCom	Telecommunication
Idis	Interdisciplinary Courses	TrDa	Theatre and Dance
Ital	Italian	TrEd	Teacher Education
Japn	Japanese	T&T	Travel and Tourism
Jour	Journalism	Univ	University
Kor	Korean	Urol	Urology
Law	Law	U&RP	Urban and Regional Planning
LEnf	Law Enforcement	WStu	Women's Studies
Libr	Library		
Math	Mathematics		



## Applied Science

Interdepartmental offerings.

### Undergraduate Courses

- 57 **Analytical Mechanics I** (2)  
First half of a one-year sequence. Concepts of statics: force systems, conditions of force and moment equilibrium, simple structures, distributed forces, centroids, internal forces, friction, moments of inertia. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and Spring)
- 58 **Analytical Mechanics II** (3)  
Second half of a one-year sequence. Concepts of dynamics: kinematics of particles, velocity and acceleration, translating and rotating reference frames, particle dynamics, motion under central and electromagnetic force, effect of Earth's rotation, vibrations, work, kinetic and potential energy, dynamics of systems of particles. Prerequisite: ApSc 57. (Fall and Spring)
- 113 **Engineering Analysis I** (3)  
Analytical methods appropriate to the solution of engineering problems: applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite or concurrent registration: Math 33. (Fall and Spring)
- 114 **Engineering Analysis II** (3)  
Analytical methods appropriate to the solution of engineering problems: complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113. (Fall and Spring)
- 115 **Engineering Analysis III** (3)  
Analytical methods appropriate to the solution of engineering problems using concepts from probability and statistics: random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, regression, and engineering applications. Prerequisite: Math 32 or OR 130. (Fall, Spring, and Summer)
- 116 **Engineering Analysis IV** (3)  
Analytical methods appropriate to the solution of engineering problems using advanced concepts from probability and statistics: multivariate distributions, expectation, generating functions, parametric families of distributions, sampling and sufficient statistics, estimation, hypothesis testing, and engineering applications. Prerequisite: ApSc 115, Math 33. (Fall and Spring)
- 199 **Honors Research Project and Seminar** (3)  
Student designs and carries out a research project under close supervision of a faculty adviser. Students from all engineering disciplines meet periodically to present projects and discuss results. Enrollment limited to students admitted to the Undergraduate Honors Research Program. May be repeated for credit.

### Graduate Courses

- 211 **Analytical Methods in Engineering I** (3)  
Engineering applications of the theory of complex variables: contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of department. (Fall and Spring)
- 212 **Analytical Methods in Engineering II** (3)  
Analytical methods appropriate to the formulation of engineering problems: finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of department. (Fall)



- 213 **Analytical Methods in Engineering III (3)**  
Analytical techniques for solution of boundary-initial-value problems in engineering: wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of department. (Fall and Spring)
- 214 **Analytical Methods in Engineering IV (3)**  
Introduction to variational methods in engineering: Ritz and Galerkin approximation methods of boundary-value problems, aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of department. (Spring, odd years)
- 215 **Analytical Methods in Engineering V (3)**  
Advanced methods of solution of boundary-initial-value problems in engineering: characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall, odd years)
- 216 **Special Topics in Engineering Analysis (3)**  
Selected topics, such as perturbation techniques applied to approximate solution of nonlinear boundary and initial-value problems in engineering; application of singular integral equations in problems of mechanics; applications of elements of functional analysis in engineering and science. Prerequisite: approval of department. (Spring, even years)

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## Civil, Mechanical, and Environmental Engineering

**Professors** G. M. Arkilic, R. R. Fox (*Chair*), H. Liebowitz, J. E. Feir, T. G. Toridis, J. Eftis, A. K. Noor, R. Goulard, K. Mahmood, A. M. Kiper, M. K. Myers, J.-N. Yang, R. E. Kaufman, D. M. Esterling, C. M. Gilmore, J. L. Whitesides, T. P. G. Liverman, V. Klein, D. L. Jones, B. M. Kramer, C. A. Garriss

**Adjunct Professors** W. P. Reid, M. P. Gaus, B. W. Hannah, B. Whang, D. D. Moran, M. O. Critchfield, A. G. Adamantiades, M. Yachnis

**Professorial Lecturers** N. L. Basdekas, D. R. Levin, W. D. Erickson, G. D. Love, S.-C. Liu, T.-F. Zien, D. J. Michel, W. D. Jackson, B. Miller, E. F. Skelton, C. J. Astill, P. D. Maycock, J. C. Hardin, R. H. Tolson, J. Sobieski, D. U. Gubser, J. I. Bregman, E. McCafferty, R. C. Macon, P. S. Lam, E. C. Yates, Jr., C. Ng, W. J. Boettinger, G. C. Everstine, J. A. Sprague, R. W. Barnwell, D. L. Dwyer, F. Farassat, C. G. Interrante, A. Kehnemui, T. Kusuda, C. F. Scheffey, C. R. Hauer, D. W. Coder, G. D. Walberg

**Associate Professors** M. I. Haque, E. T. Moyer, Jr., R. Löhner (*Research*)

**Associate Professorial Lecturers** B. Dendrou, M. A. Imam

**Associate Professors** J. C. Yu, D. W. Ellison, R. Y.-Y. Ting, M. C. Cullingford, F. L. Willingham, Jr., A. B. Wardlow, Jr., C. J. Jacimowski, M. M. Mikulas, Jr., J. C. Coolbaugh, K. Khozeimeh, L. D. Pinson,



R. L. Bowles, W. D. Burrows, C. Winklehaus, R. F. Jones, Jr., S. C. Mehrotra, D. R. Mulville, S. Basu, I. S. Raju, R. Chung, S. M. Joshi, R. E. Lindberg, Jr., T. A. Zang, Jr., S. L. Zimmerman, C. C. Frantz, A. Ghamarian, J. F. O'Dea, W. B. Fichter, L. B. Garrett, P. N. Majumdar

**Assistant Professor** S. Sarkani, M. I. Anjum (*Visiting*)

**Assistant Professorial Lecturers** R. C. Montgomery, R. Lee, H. L. Beach, Jr., K. Sutton, T. L. Walton, Jr., G. E. Hicho, M. P. Gottlieb, W. Kulyk, J. N. Moss, E. T. Von Briesen, N. F. Knight, Jr., J. M. Luckring, K. G. Garrahan, A. L. Dinsenhacher, H. Biswas, A. A. Oni, S. H. Yang, A. D. Cutler, G. L. Smith, R. P. Weston

## Civil Engineering Undergraduate Study

Civil engineering encompasses those branches of engineering most closely related to the control and improvement of our environment and of the physical conditions of life. Study in this field prepares students for careers in the planning, design, and construction of buildings, bridges, roads, airports, rapid transportation systems, harbors, off-shore facilities, coastal protection structures, flood- and pollution-control systems for rivers and lakes, inland navigation systems, large power-generation and flood-control dams, water resources projects, urban renewal and development programs, and pollution-control and waste-disposal projects. It also provides the scientific and technological background required for careers in municipal engineering, urban and regional planning, environmental and geotechnical civil engineering, and research in structural mechanics, ocean engineering, and materials engineering.

The curriculum equips the student to begin a career upon graduation, to register as a professional civil engineer as required by law, and to pursue graduate study.

### Part-Time Study

To accommodate individuals employed full time in the Washington, D.C., area who wish to obtain the Bachelor of Science (Civil Engineering) degree, evening and late afternoon classes are scheduled on a regular basis. A part-time student who enrolls for three courses a semester, for example, may expect to complete B.S. degree requirements within 15 semesters.

### Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

#### First Semester

- CSci 51: Introduction to Computing (3)
- Engl 9 or 10: English Composition: Language as Communication (3)
- Math 31: Single-Variable Calculus I (3)
- Phys 13: General Physics for Engineering and Applied Science (3)
- Elective: Selected from humanities or social sciences (3)

#### Second Semester

- Chem 13: General Chemistry (4)
- EngS 4: Engineering Drawing and Computer Graphics (3)



- Math 32: Single-Variable Calculus II (3)  
 Phys 14: Mechanics and Thermal Physics (3)  
 Elective: Selected from humanities or social sciences (3)

### Third Semester

- ApSc 57: Analytical Mechanics I (2)  
 ApSc 113: Engineering Analysis I (3)  
 ApSc 115: Engineering Analysis III (3)  
 Math 33: Multivariable Calculus (3)  
 Phys 15: Electricity and Magnetism (3)  
 Elective: Selected from humanities or social sciences (3)

### Fourth Semester

- ApSc 58: Analytical Mechanics II (3)  
 ApSc 114: Engineering Analysis II (3)  
 CE 120: Introduction to the Mechanics of Solids (3)  
 CE 140: Materials Science (3)  
 Phys 16: Modern Physics (3)  
 Elective: Selected from humanities or social sciences (3)

## Civil Engineering Curriculum

### Fifth Semester

- CE 117: Engineering Computations (3)  
 CE 121: Structural Theory I (3)  
 CE 166: Materials Engineering (2)  
 CE 167: Mechanics of Materials Laboratory (1)  
 ME 126: Fluid Mechanics (3)  
 ME 131: Thermodynamics (3)

### Sixth Semester

- CE 122: Structural Theory II (3)  
 CE 192: Reinforced Concrete Structures (3)  
 CE 193: Hydraulics (3)  
 Engl 110: Writing in Engineering and the Sciences (3)  
 Geol 136: Introduction to Engineering Geology (3)  
 Elective: Selected from humanities or social sciences (3)

### Seventh Semester

- CE 168: Introductory Soil Mechanics (3)  
 CE 190: Contracts and Specifications (2)  
 CE 191: Metal Structures (3)  
 CE 194: Environmental Engineering I: Water Resources and Water Quality (3)  
 CE 195: Hydrology (3)  
 Elective: Technical elective (3)

### Eighth Semester

- CE 182: Foundation Engineering (2)  
 CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)  
 CE 196: Design and Cost Analysis of Civil Engineering Structures (3)



- CE 197: Environmental Engineering II: Water Supply and Pollution Control (3)  
 Elective: Technical electives (8)\*

### Technical Electives

- ApSc 199: Honors Research Project and Seminar (3)  
 CE 198: Research (3)  
 CE 201: Design of Metal Structures (3)  
 CE 202: Design of Reinforced Concrete Structures (3)  
 CE 203: Prestressed Concrete Structures (3)  
 CE 204: Applied Soil Mechanics I (3)  
 CE 206: Geotechnical Engineering (3)  
 CE 208: Rock Engineering (3)  
 CE 210: Methods of Structural Analysis (3)  
 CE 212: Open Channel Flow (3)  
 CE 213: Hydraulic Structures (3)  
 CE 214: Design of Dams (3)  
 CE 215: Urban Construction Technology (3)  
 CE 216: Advanced Hydrology (3)  
 CE 220: Urban Transportation Engineering (3)  
 CE 222: Stations and Terminals (3)  
 CE 223: Traffic Engineering (3)  
 CE 240: Principles of Environmental Engineering I (3)  
 CE 241: Principles of Environmental Engineering II (3)  
 CE 243: Environmental Impact Assessment (3)  
 CE 253: Failure and Reliability Analysis of Engineering Structures (3)  
 CE 255: Introduction to Ocean and Coastal Engineering (3)  
 CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)  
 CE 282: Hydraulic Modeling (3)  
 EAd 160: Introduction to Engineering Economic Analysis (3)  
 EngS 215: Advanced Strength of Materials (3)  
 EngS 231: Structure of Materials (3)  
 EngS 234: Composite Materials (3)  
 EngS 237: Environmental Effects on Materials (3)  
 EngS 241: Failure of Materials (3)  
 EngS 242: Materials Recycling and Recovery (3)  
 EngS 282: Computer-Aided Design (3)  
 EngS 284: Numerical Methods in Engineering (3)

### Civil Engineering Undergraduate Courses

- 117 **Engineering Computations** (3)  
 Application of numerical methods to the solution of engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)
- 120 **Introduction to the Mechanics of Solids** (3)  
 Stress and strain, axial load problems, torsion, shear force and bending moment, pure bending of beams, shearing stresses in beams, compound stresses, analysis of plane stress and plane strain, combined stresses, deflection of beams, statically indeterminate problems, columns, the energy methods. Prerequisite: ApSc 57, 113. (Fall and Spring)

\* EAd 160 *Introduction to Engineering Economic Analysis* is strongly recommended as a technical elective.



- 121 **Structural Theory I** (3)  
Theory of statically determinate structures; stability and determinacy; influence lines and moving loads. Analysis of roof systems and cable structures. Calculation of deflections. Approximate methods of analysis of indeterminate structures. Prerequisite or concurrent registration: CE 120. (Fall)
- 122 **Structural Theory II** (3)  
Theory of statically indeterminate structures using matrix methods and classical approaches such as moment distribution and slope-deflection; influence lines; energy methods. Prerequisite: CE 121. (Spring)
- 140 **Materials Science** (3)  
Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; phase transformations, mechanical properties, electrical conduction; metals, insulators, semiconductors; magnetism; optical properties. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and Spring)
- 166 **Materials Engineering** (2)  
Mechanical properties, plastic deformation dislocation theory, yielding, strengthening mechanisms, microstructure and properties, heat treatment of steel, composites, amorphous materials, viscoelastic deformation, creep, fracture, fatigue, fatigue crack propagation. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and Spring)
- 167 **Mechanics of Materials Laboratory** (1)  
Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact, and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and Spring)
- 168 **Introductory Soil Mechanics** (3)  
Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)
- 182 **Foundation Engineering** (2)  
Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures, professional ethics applications. Prerequisite: CE 168. (Spring)
- 185 **Soil Mechanics and Foundation Engineering Laboratory** (1)  
Laboratory experiments for the classification, strength, compressibility, and general engineering properties of soils. Prerequisite: CE 168. (Spring)
- 190 **Contracts and Specifications** (2)  
Law of contracts, construction contracts, specifications, bidding, insurance and bonds, professional liability, arbitration of disputes, litigation. (Fall)
- 191 **Metal Structures** (3)  
Principles of the design of metal structures, structural elements, connections, specific problems of analysis, methods of construction, professionalism in design. Prerequisite: CE 122. (Fall)
- 192 **Reinforced Concrete Structures** (3)  
Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121; or concurrent registration: CE 122. (Spring)
- 193 **Hydraulics** (3)  
Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Spring)
- 194 **Environmental Engineering I: Water Resources and Water Quality** (3)  
Introduction to available water resources and their uses. Methods of evaluating water quality; causes and effects of quality, including impact on human health and aquatic life. Regulatory concepts and practices. Municipal water and waste-



- water systems. Course requirements include four periods of laboratory work. Prerequisite or concurrent registration: CE 193. (Fall)
- 195 **Hydrology (3)**  
Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)
- 196 **Design and Cost Analysis of Civil Engineering Structures (3)**  
Total structural systems concepts. Design of civil engineering structures such as piers, wharves, bulkheads, offshore platforms, dams, and other special structures. Principles of cost analysis for timber, steel, and reinforced concrete structures. Prerequisite: senior status. (Spring)
- 197 **Environmental Engineering II: Water Supply and Pollution Control (3)**  
Water sources and their development. Water distribution and wastewater collection systems, including applied hydraulics of pipelines and pumps. Physical, chemical, and biological treatment of water and wastewater. Planning to meet quality needs and regulatory requirements. Course requirements include four periods of laboratory work. Prerequisite: CE 194. (Spring)
- 198 **Research (1 to 3)**  
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Mechanical Engineering Undergraduate Study

Mechanical engineering is primarily concerned with physical systems in motion—with the conversion, transfer, and control of energy from its source to its moving system. Mechanical engineers are involved in work with, for example, land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, pollution-control devices, synthetic fuels, and energy resources and practical means of converting various forms of energy to mechanical and electrical power. Training in this area should provide the ability to formulate problems based on fundamental laws of nature, to recognize the methods applicable to their solution, to read with understanding the relevant work, and to come up with usable answers.

The curriculum in mechanical engineering begins with a foundation in physics, chemistry, mathematics, humanities, and social sciences and progresses to studies in basic mechanics of solids and fluids, electricity and electronics, materials sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design and control of machines and systems. Computer applications in mechanical engineering are an integral part of many courses. These applications include computer-aided drafting, analysis of mechanical system components, optimization of mechanical engineering systems, and laboratory data collection and reduction. Technical electives in the senior year permit students to select from a range of specialty options, including computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering.

Graduates of the mechanical engineering curriculum are qualified for professional positions in analysis, research and development, computer-aided design, and manufacturing and for graduate study and research in a variety of fields.



### Part-Time Study

To accommodate individuals employed full time in the Washington, D.C., area who wish to obtain the Bachelor of Science (Mechanical Engineering) degree, late afternoon and evening classes are scheduled on a regular basis. A part-time student who enrolls for three courses a semester, for example, may expect to complete B.S. degree requirements within 15 semesters.

### Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment of degree requirements. This exchange program has been extended to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad. The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general and international technical fields in particular. Students must apply for admission to the Junior Year Abroad Program to the department chair before the end of the fall semester of the sophomore year. Approval must be given by the department chair and the dean of the School of Engineering and Applied Science.

### Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

#### First Semester

- CSci 51: Introduction to Computing (3)
- Engl 9 or 10: English Composition: Language as Communication (3)
- Math 31: Single-Variable Calculus I (3)\*
- Phys 13: General Physics for Engineering and Applied Science (3)
- Elective: Selected from humanities or social sciences (3)

#### Second Semester

- Chem 13: General Chemistry (4)
- EngS 4: Engineering Drawing and Computer Graphics (3)
- Math 32: Single-Variable Calculus II (3)
- Phys 14: Mechanics and Thermal Physics (3)
- Elective: Selected from humanities or social sciences (3)

#### Third Semester

- ApSc 57: Analytical Mechanics I (2)
- ApSc 113: Engineering Analysis I (3)

Transfer students who have not successfully completed a college-level calculus course with a grade of C- or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-semester math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test may be required to take Math 3, 6, or 30 to make up the deficiency.



ApSc 115: Engineering Analysis III (3)  
Math 33: Multivariable Calculus (3)  
Phys 15: Electricity and Magnetism (3)  
Elective: Selected from humanities or social sciences (3)

#### **Fourth Semester**

ApSc 58: Analytical Mechanics II (3)  
ApSc 114: Engineering Analysis II (3)  
CE 140: Materials Science (3)  
EE 11: Linear Networks I (3)  
Phys 16: Modern Physics (3)  
Elective: Selected from humanities or social sciences (3)

### **Mechanical Engineering Curriculum**

#### **Fifth Semester**

CE 120: Introduction to the Mechanics of Solids (3)  
CE 166: Materials Engineering (2)  
CE 167: Mechanics of Materials Laboratory (1)  
ME 117: Engineering Computations (3)  
ME 131: Thermodynamics (3)  
ME 134: Introduction to Vibration Analysis (3)

#### **Sixth Semester**

EE 20: Introductory Engineering Electronics (3)  
Engl 110: Writing in Engineering and the Sciences (3)  
ME 120: Methods of Engineering Experimentation (2)  
ME 126: Fluid Mechanics I (3)  
ME 148: Thermodynamic Systems (3)  
ME 191: Mechanical Design (3)

#### **Seventh Semester**

ME 187: Heat Transfer (3)  
ME 190: Analysis and Synthesis of Mechanisms (3)  
ME 192: Manufacturing Processes and Systems (3)  
ME 193: Engineering Systems Design (3)  
Elective: Technical electives (6)

#### **Eighth Semester**

ME 152: Mechanical Engineering Laboratory (2)  
ME 182: Electromechanical Control System Design (3)  
ME 195: Computer-Aided Design of Mechanical Systems (2)  
ME 196: Design Project (1)  
Elective: Technical electives (6)  
Elective: Selected from humanities or social sciences (3)

### **Mechanical Engineering Options**

A minimum of 12 semester hours of technical electives must be taken in one of the following options. Alternative elective programs or individual course substitutions may be approved upon written request by the student to his or her adviser and the department. An asterisk indicates that the course is required for that option.



## Computer-Aided Design

- ApSc 199: Honors Research Project and Seminar (3)
- CSci 147: Assembly Language Programming I (3)
- CSci 150: Introduction to Microcomputers (3)
- CSci 153: Design of Switching Systems (3)
- CSci 157: Assembly Language Programming II (3)
- CSci 160: Concepts of Programming Languages (3)
- EngS 282: Computer-Aided Design (3)
- EngS 283: Application of Computer Graphics in Engineering (3)
- EngS 284: Numerical Methods in Engineering (3)
- EngS 285: Finite Element Methods in Engineering Mechanics (3)
- \*ME 197: Robotic Systems Design and Applications (3)
- ME 198: Research (3)
- ME 241: Computer Models of Physical and Engineering Systems (3)
- ME 251: Computer-Integrated Manufacturing (3)

## Energy and Power

- ApSc 199: Honors Research Project and Seminar (3)
- EngS 208: Energy Conservation (3)
- \*ME 155: Fluid Mechanics II (3)
- ME 198: Research (3)
- ME 257: Energy Systems Analysis I (3)
- ME 258: Energy Systems Analysis II (3)
- ME 259: Solar Heating Systems (3)
- ME 260: Heating and Air-Conditioning of Buildings (3)
- ME 291: Power Systems I (3)
- ME 292: Power Systems II (3)

## Fluid Mechanics and Thermal Sciences

- ApSc 199: Honors Research Project and Seminar (3)
- EngS 218: Introduction to Continuum Mechanics (3)
- \*ME 155: Fluid Mechanics II (3)
- ME 198: Research (3)
- ME 221: Intermediate Fluid Mechanics (3)
- ME 231: Hydrodynamics (3)
- ME 237: Propulsion (3)
- ME 280: Intermediate Thermodynamics (3)
- ME 288: Convective Heat and Mass Transfer (3)
- ME 289: Radiative Heat Transfer (3)

## Mechanical Engineering Design

- ApSc 199: Honors Research Project and Seminar (3)
- EngS 215: Advanced Strength of Materials (3)
- EngS 257: Theory of Vibrations (3)
- EngS 284: Numerical Methods in Engineering (3)
- EngS 285: Finite Element Methods in Engineering Mechanics (3)
- \*ME 197: Robotic Systems Design and Applications (3)
- ME 198: Research (3)
- ME 240: Kinematic Synthesis (3)
- ME 241: Computer Models of Physical and Engineering Systems (3)
- ME 242: Advanced Mechanisms (3)
- ME 243: Advanced Mechanical Engineering Design (3)
- ME 251: Computer-Integrated Manufacturing (3)



**Solid Mechanics and Materials Engineering**

- ApSc 199: Honors Research Project and Seminar (3)
- EngS 215: Advanced Strength of Materials (3)
- \*EngS 218: Introduction to Continuum Mechanics (3)
- EngS 221: Theory of Elasticity I (3)
- EngS 231: Structure of Materials (3)
- EngS 233: Mechanics of Composite Materials (3)
- EngS 234: Composite Materials (3)
- EngS 237: Environmental Effects on Materials (3)
- EngS 241: Failure of Materials (3)
- EngS 285: Finite Element Methods in Engineering Mechanics (3)
- ME 198: Research (3)
- Phys 170: Elementary Solid-State Physics (3)

**Mechanical Engineering Undergraduate Courses**

- 117 **Engineering Computations** (3)  
Application of numerical methods to the solution of engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling, numerical methods, and problem-solving techniques. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)
- 120 **Methods of Engineering Experimentation** (2)  
Acquisition and analysis of experimental data. Laws of modeling and simulation. Report formulation and presentation. Basic principles of measuring instruments and sensors. Fundamentals of digital data acquisition and use of computer-based data systems. Laboratory experiments including the use of strain gages, oscilloscopes, transducers, and computerized data systems. Prerequisite: ME 117. (Spring)
- 126 **Fluid Mechanics I** (3)  
Fluid properties, fluid statics, integral and differential formulations of conservation of mass, momentum, and energy. Bernoulli's equation. Dimensional analysis and similitude. Inviscid flow. Viscous flow. Experimental and computational methods in fluid mechanics. Prerequisite: ApSc 58. (Spring)
- 131 **Thermodynamics** (3)  
Fundamental thermodynamic concepts, Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodynamics, properties of pure substances, first-law analysis of some thermodynamic systems, second law of thermodynamics, reversibility, entropy, second-law analysis of thermodynamic systems. Prerequisite: ApSc 113, Phys 14. (Fall)
- 134 **Introduction to Vibration Analysis** (3)  
Natural frequencies, free vibration, forced vibration. Unbalance, whirling, vibration isolation. Measuring techniques and application of computers in vibration analysis. Multiple degrees of freedom. Dynamic vibration absorbers. Shock and transient vibration. Prerequisite: ApSc 58. (Fall)
- 148 **Thermodynamic Systems** (3)  
Second-law analysis of thermodynamic systems. Mixtures of gases and vapors, properties of air-water vapor mixtures, psychrometry and its application in some engineering processes. Power from two-phase systems, Rankine cycle and regeneration. Gas turbine, Brayton and regenerative cycles. Internal combustion engines, Otto and diesel cycles. Thermodynamic analysis of reactive systems. Prerequisite: ME 131. (Spring)
- 152 **Mechanical Engineering Laboratory**(2)  
Project-oriented course. Simulates working environment of professional engineers. Projects are assigned in student's areas of interest; student is expected to design and assemble own experiments. Extensive use of instrumentation and



computing facilities. Project proposal, progress reports, final report, and periodic oral presentations required. Prerequisite: ME 120. (Spring)

155 **Fluid Mechanics II** (3)

Potential flow theory: stream and potential functions, Laplace's equation, superposition of elementary flows. D'Alembert's paradox. Boundary-layer theory: von Kármán momentum integral method. Drag on immersed bodies: form drag and skin friction for streamlined and bluff bodies in laminar and turbulent flow. Turbulence: Prandtl mixing length, eddy viscosity, and transport phenomena. Compressible flow: acoustic speed, Mach number, isentropic flow, nozzle flow and flow around airfoils and turbine blades, normal and oblique shock phenomena, Raleigh and Fanno flows. Experimental and computational methods in fluid mechanics. Prerequisite: ME 126, 131. (Fall)

182 **Electromechanical Control System Design** (3)

Application of control theory to the design of electromechanical systems. Characteristics of transducers, valves, and other control components. Mathematical models of open- and closed-loop electromechanical systems. Root locus and frequency response methods; application to the synthesis of feedback systems by both manual and computer-aided techniques. Prerequisite: ApSc 114; ME 117, 134. (Spring)

187 **Heat Transfer** (3)

Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective heat transfer. Evaluation of convective-heat-transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative heat transfer between surfaces. Design considerations: heat-exchanger design and selection. Prerequisite: senior status. (Fall)

190 **Analysis and Synthesis of Mechanisms** (3)

Kinematics and dynamics of mechanisms. Displacements, velocities, and accelerations in linkage, cam, and gear systems by analytical, graphical, and computer methods. Synthesis of linkages to meet prescribed performance requirements. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)

Integration of knowledge of strength of materials in a design context. Stresses and deflections in engineering structures. Theories of failure. Introduction to the design of mechanical components, such as fasteners, shafts, springs. Introduction to the use of computers in mechanical engineering design. Prerequisite: CE 120, ME 117. (Spring)

192 **Manufacturing Processes and Systems** (3)

Introduction to modern manufacturing techniques for metals, polymers, ceramics, and composite materials. Relationships between properties of materials and techniques for processing them. Process selection, design, control, and integration. Computer-integrated manufacturing, robotic applications, and assembly automation. Prerequisite: junior status or permission of instructor. (Fall)

193 **Engineering Systems Design** (3)

Creative engineering design, problem definition, and concept generation. Design of and familiarization with bearings, clutches, brakes, and couplings. Optimization of system design using computers and design projects. Graphical communication, project presentation, and use of existing design resources. Prerequisite: ME 191. (Fall)

194 **Energy Conversion** (3)

Energy sources and utilization, principal fuels for energy conversion. Production of thermal energy, conversion of chemical energy, fossil fuel systems. Energy conservation and environmental considerations in energy conversion and use. Production of electrical energy, fundamental principles, technological options, longer-range possibilities. Energy management and economic considerations. Prerequisite: EE 20, ME 148. (Spring)



**195 Computer-Aided Design of Mechanical Systems (2)**

Presentation of the major elements in a computer-aided design system, including interactive computer graphics, database management, and interactive analysis methods, such as the finite element method. Design of systems involving a variety of constraints. Consideration of economic, safety, and reliability factors in the design process. Prerequisite: ME 193; concurrent registration: ME 196. (Spring)

**196 Design Project (1)**

Identification and preparation of a design project, including problem formulation, feasibility studies and preliminary design, prototype development and testing, and design optimization. Concurrent registration: ME 195. (Spring)

**197 Robotic Systems Design and Applications (3)**

Modeling and analysis of robot designs. Kinematics, statics, and dynamics of mechanical linkages. Design and analysis of mechanical structures, actuators, transmissions, and sensors. Design of robot control systems, including techniques of adaptive control and artificial intelligence. Principles of vision systems and image analysis. Relevant computer hardware and software. Current industrial applications and limitations of robotic systems. Same as EE 192. (Fall and Spring)

**198 Research (1 to 3)**

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

**Engineering Science Undergraduate Course****4 Engineering Drawing and Computer Graphics (3)**

Introduction to technical drawing, including use of instruments, lettering, geometric construction, sketching, orthographic projection, section and auxiliary views, dimensioning, pictorial drawing, and intersections and developments. Introduction to computer graphics, including topics covered in manual drawing, and computer-aided drafting. (Fall and Spring)

**Graduate Study**

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in various areas of concentration, leading to the Master of Science, the professional, and the Doctor of Science degrees.

The Doctor of Science degree is offered in the following areas: aeroacoustics, aeronautics, astronautics, computer-integrated design and manufacturing, energy, environmental engineering, fluid mechanics and thermal sciences, solid mechanics and materials science, structural engineering, structures and dynamics, and water resources (except the water resources planning option, which is for the M.S. degree only).

The Master of Science and the professional degrees are offered in all of the above areas and in the following: civil engineering, computer-aided design, geotechnical engineering, mechanical engineering design, and ocean and marine engineering (M.S. degree only).

Courses for these specializations are listed on the following pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science and from other schools and divisions of the University. Some of the programs leading to the Master of Science and, by special permission of the department chair, Doctor of Science degrees are offered at the NASA-Langley Research Center, Hampton,



Virginia. NASA-Langley's extensive scientific and engineering facilities are used whenever possible.

Each program is designed to fit the student's needs, interests, and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests with whom he or she will work closely during the course of the program. Graduate areas of concentration and faculty advisers are listed below.

*Aeroacoustics*: Myers, Whitesides

*Aeronautics*: Goulard, Myers, Noor, Whitesides

*Astronautics*: Goulard, Myers, Noor, Whitesides

*Civil Engineering*: Fox

*Computer-Aided Design*: Esterling, Jones, Kaufman, Kramer, Toridis, Yang

*Computer-Integrated Design and Manufacturing*: Esterling, Jones, Kaufman, Kramer

*Energy*: Garriss, Goulard, Kiper

*Environmental Engineering*: Fox

*Fluid Mechanics and Thermal Sciences*: Garriss, Goulard, Kiper, Myers

*Geotechnical Engineering*: Fox

*Mechanical Engineering Design*: Jones, Kaufman, Kramer

*Solid Mechanics and Materials Science*: Arkilic, Eftis, Esterling, Gilmore, Jones, Moyer, Yang

*Structural Engineering*: Fox, Sarkani, Toridis, Yang

*Structures and Dynamics*: Arkilic, Noor, Sarkani, Toridis, Yang

*Water Resources Engineering*: Haque, Mahmood

### Admission Requirements

The applicant must be recommended for admission by the chair of the Department of Civil, Mechanical, and Environmental Engineering. For the Master of Science degree program, a grade average of *B* for the last two years of undergraduate study will normally be required; for the professional degree program, a quality-point index of at least 3.0 (on a 4.0 scale) in course work leading to the master's degree will normally be required; and for the Doctor of Science degree program, a quality-point index of at least 3.4 (on a 4.0 scale) in course work leading to the master's degree will normally be required.

### Computer Requirements

Because the use of computers has become an integral part of both education and research, each student entering graduate study in the Department of Civil, Mechanical, and Environmental Engineering should be familiar with the use of computers. The ability to use computers will be assumed in graduate courses.

### Language Requirement for Doctoral Program

Proficiency in one computer programming language, however, must be demonstrated to the doctoral adviser.

### Fields of Concentration

Programs of study in any field of concentration will generally include courses in appropriate allied areas.



*In this section, an asterisk indicates that a course or program is offered at NASA-Langley Research Center. The course or program may also be offered on campus regularly or when arranged.*

### **Aeroacoustics\***

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- EngS 217: Analytical Mechanics
- EngS 257: Theory of Vibrations
- EngS 270: Theoretical Acoustics I
- \*EngS 271: Random Process Theory I
- \*EngS 272: Random Process Theory II
- \*EngS 273: Time Series Analysis
- EngS 274: Environmental Noise Control
- \*EngS 275: Theoretical Acoustics II
- \*EngS 276: Acoustical and Mechanical Measurements
- \*EngS 277: Physical Acoustics
- \*EngS 278: Psychological and Physiological Acoustics
- \*EngS 279: Human Factors in Engineering
- \*EngS 280: Special Topics in Acoustics
- EngS 298: Research
- EngS 299-300: Thesis Research
- \*EngS 310: Aeroacoustics
- \*EngS 311: Nonlinear Acoustics
- \*EngS 312: Theory of Random Vibration
- \*EngS 313: Structural Acoustics Interaction
- EngS 398: Advanced Reading and Research
- EngS 399: Dissertation Research
- ME 221: Intermediate Fluid Mechanics
- ME 312: Theory of Turbulence

Required courses for M.S. degree: ApSc 211, 213; EngS 270, 274 or 276; ME 221.  
 Required courses for the professional and doctoral degrees are established by the advisory committee in consultation with the student.

### **Aeronautics\***

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- EE 202: Linear Systems Theory
- EngS 217: Analytical Mechanics
- EngS 257: Theory of Vibrations
- EngS 284: Numerical Methods in Engineering
- \*ME 201: Computational Fluid Dynamics Laboratory
- \*ME 202: Computational Aerodynamics Laboratory
- \*ME 203: Experimental Techniques in Aerodynamics
- \*ME 208: Research in Computational Fluid Dynamics
- ME 221: Intermediate Fluid Mechanics
- ME 222: Applied Aerodynamics
- ME 227: Viscous Flow



- ME 231: Hydrodynamics
- ME 233: Aeroelasticity I
- ME 234: Aeroelasticity II
- ME 235: Compressible Flow
- ME 237: Propulsion
- \*ME 247: Seminar: Aircraft Design I
- \*ME 248: Seminar: Aircraft Design II
- \*ME 270: Aerodynamics of Flight Vehicles
- \*ME 271: VTOL Aircraft Technology
- \*ME 272: Powered-Lift Technology
- \*ME 273: Principles of Automatic Flight Control
- ME 274: Principles of Flight Guidance
- ME 275: Stability and Control of Vehicles
- ME 276: Mechanics of Space Flight
- ME 277: Computational Fluid Dynamics
- \*ME 279: Special Topics in Flight Sciences
- ME 281: Advanced Thermodynamics
- \*ME 290: Kinetic Theory of Gases
- ME 295: Statistical Thermodynamics
- ME 298: Research
- ME 299-300: Thesis Research
- ME 312: Theory of Turbulence
- ME 315: Hypersonic Flow
- ME 398: Advanced Reading and Research
- ME 399: Dissertation Research

Required courses for M.S. degree: ApSc 211, 213; ME 221, 275.

Professional and doctoral degree programs are offered only at the NASA-Langley Research Center. Required courses are established by the advisory committee in consultation with the student.

### Astronautics\*

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- EE 271: Linear Multivariable Control Theory
- EE 272: Computer Control Systems
- EE 273: Systems Optimization
- EE 274: Nonlinear Systems
- EE 277: Satellite Communications Systems
- EE 278: Spacecraft Systems Design
- EngS 217: Analytical Mechanics
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- \*EngS 286: Analysis and Design of Thin-Walled Structures
- \*EngS 287: Automated Design of Complex Structures
- EngS 314: Advanced Numerical Methods
- ME 221: Intermediate Fluid Mechanics
- ME 235: Compressible Flow
- ME 237: Propulsion
- ME 238: Energetics of Fluid Flow
- \*ME 249: Spacecraft Design
- \*ME 250: Launch Vehicle Design
- \*ME 273: Principles of Automatic Flight Control



- \*ME 276: Mechanics of Space Flight
- ME 280: Intermediate Thermodynamics
- ME 287: Heat Conduction
- ME 288: Convective Heat and Mass Transfer
- \*ME 290: Kinetic Theory of Gases
- ME 298: Research
- ME 299-300: Thesis Research
- ME 315: Hypersonic Flow
- ME 398: Advanced Reading and Research
- ME 399: Dissertation Research

Required courses for M.S. degree: ApSc 211, 213; ME 221, 276.

### Civil Engineering†

- ApSc 211: Analytical Methods in Engineering I
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- CE 201: Design of Metal Structures
- CE 202: Design of Reinforced Concrete Structures
- CE 203: Prestressed Concrete Structures
- CE 204: Applied Soil Mechanics I
- CE 205: Applied Soil Mechanics II
- CE 206: Geotechnical Engineering
- CE 208: Rock Engineering
- CE 210: Methods of Structural Analysis
- CE 211: Environmental Chemistry
- CE 212: Open Channel Flow
- CE 213: Hydraulic Structures
- CE 214: Design of Dams
- CE 215: Urban Construction Technology
- CE 216: Advanced Hydrology
- CE 219: Groundwater and Seepage
- CE 220: Urban Transportation Engineering
- CE 221: Pavement and Runway Design
- CE 223: Traffic Engineering
- CE 240: Principles of Environmental Engineering
- CE 241: Water and Wastewater Treatment Processes
- CE 243: Environmental Impact Assessment
- CE 250: Advanced Metal Structures
- CE 251: Advanced Reinforced Concrete Structures
- CE 253: Reliability Analysis of Engineering Structures
- CE 255: Introduction to Ocean and Coastal Engineering
- CE 256: Coastal Processes
- CE 257: Harbor and Coastal Engineering
- CE 258: Application of Probability Methods in Civil Engineering
- CE 276: Water Resources Planning and Control
- CE 298: Research
- CE 299-300: Thesis Research
- EAd 204: Administration of Engineering Contracts
- EAd 210: Engineering Law
- EAd 242: Construction Management II
- EAd 243: Construction Management III
- EAd 261: Economic Analysis in Engineering Planning
- EAd 265: Transportation Management I

† A minimum of seven courses must be taken in the CMEE department to meet the degree requirements.



- EAd 266: Transportation Management II
- EngS 228: Physical Oceanography
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- EngS 398: Advanced Reading and Research
- ME 218: Design of Floating and Submerged Marine Vehicles
- ME 221: Intermediate Fluid Mechanics
- ME 231: Hydrodynamics
- ME 255-56: Urban Transportation Technology
- OR 201: Survey of Operations Research: Deterministic Models
- OR 231: Theory of Traffic Flow
- †Pad 242: Administration of State and Local Governments
- †Pad 249: Urban Public Policy
- †Pad 252: Public Expenditure Analysis and Planning

*Ocean and Coastal Engineering Option*

Required courses for M.S. degree: ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 255.

*Public Works Engineering Option†*

Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.

For professional degree: CE 241 or 223 or 276; EngS 284 or OR 201; EAd 242 or 243.

*Transportation Engineering Option†*

Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.

*Computer-Aided Design*

- ApSc 213: Analytical Methods in Engineering III
- CE 201: Design of Metal Structures
- CE 202: Design of Reinforced Concrete Structures
- CE 203: Prestressed Concrete Structures
- CE 210: Methods of Structural Analysis
- CE 250: Advanced Metal Structures
- CE 251: Advanced Reinforced Concrete Structures
- CE 254: Special Topics in Structural Engineering
- CE 261: Analysis of Plates and Shells
- CE 263: Theory of Structural Stability
- CE 266: Design to Resist Natural Hazards I: Effects of Extreme Wind
- CE 267: Design to Resist Natural Hazards II: Earthquakes
- CSci 147: Assembly Language Programming I
- CSci 157: Assembly Language Programming II
- CSci 159: Programming and Data Structures
- CSci 160: Concepts of Programming Languages
- CSci 161: Discrete Structures for Computing
- CSci 201: Introduction to Computer Systems
- CSci 212: Discrete Analysis in Computer Science
- CSci 215: Advanced Data Structures
- CSci 216: Information Retrieval Systems
- CSci 219: Interactive Computer Graphics I
- CSci 222: Design of User-Computer Dialogues

For course description, see the *Undergraduate and Graduate Programs Bulletin*.  
 Minimum of seven courses must be taken in the CMEE department to meet the degree requirements.



- CSci 224: Artificial Intelligence
- CSci 227: Management Information Systems and Database Management
- CSci 258: Advanced Programming Languages
- CSci 281: Numerical Solutions of Algebraic Systems
- EngS 257: Theory of Vibrations
- EngS 282: Computer-Aided Design
- EngS 283: Application of Computer Graphics in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- EngS 288: Advanced Finite Element Methods in Structural Mechanics
- ME 218: Design of Floating and Submerged Marine Vehicles
- ME 237: Propulsion
- ME 238: Energetics of Fluid Flow
- ME 240: Kinematic Synthesis
- ME 241: Computer Models of Physical and Engineering Systems
- ME 242: Advanced Mechanisms
- ME 243: Advanced Mechanical Engineering Design
- ME 246: Electromechanical Control Systems

Required courses for M.S. degree: ApSc 213; CSci 159, 201; EngS 282 or ME 243; EngS 284; CSci 219 or EngS 283. In place of CSci 201, CSci 157 or 147 and 158 may be taken.

For professional degree: CE 203, 250 or 251, 254 or EngS 257; CSci 216, 227.

### Computer-Integrated Design and Manufacturing

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- CSci 159: Programming and Data Structures
- CSci 201: Introduction to Computer Systems
- CSci 215: Advanced Data Structures
- CSci 219: Interactive Computer Graphics II
- CSci 224: Artificial Intelligence
- CSci 226: Robotics
- CSci 319: Interactive Computer Graphics III
- EAd 217: Fundamentals of Artificial Intelligence
- EAd 253: Production Management
- EAd 262: Finance for Engineers
- EAd 270: Cooperating Expert Systems
- EngS 215: Advanced Strength of Materials
- EngS 221: Theory of Elasticity I
- EngS 241: Failure of Materials
- EngS 257: Theory of Vibrations
- EngS 282: Computer-Aided Design
- EngS 283: Application of Computer Graphics in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- EngS 288: Advanced Finite Element Methods in Structural Mechanics
- EngS 314: Advanced Numerical Methods
- ME 240: Kinematic Synthesis
- ME 241: Computer Models of Physical and Engineering Systems
- ME 242: Advanced Mechanisms
- ME 243: Advanced Mechanical Engineering Design
- ME 246: Electromechanical Control Systems
- ME 286: Special Topics in Mechanical Engineering
- ME 251: Computer-Integrated Manufacturing
- ME 252: Projects in Computer-Integrated Design and Manufacturing



- ME 299-300: Thesis Research  
 ME 398: Advanced Reading and Research  
 ME 399: Dissertation Research  
 OR 275: Introduction to Scheduling  
 OR 279: Inventory Control

Required courses for M.S. degree: ME 240, 241, 243, 246, 251.

For professional degree: EAd 270; EngS 283; ME 241, 252; OR 275.

For D.Sc. degree: ApSc 212, 213; EAd 217 or CSci 224; EngS 285; ME 252.

Since computer-integrated design and manufacturing encompasses a broad range of subject matter, special elective programs in other areas may be arranged.

## Energy

- ApSc 211: Analytical Methods in Engineering I  
 ApSc 212: Analytical Methods in Engineering II  
 ApSc 213: Analytical Methods in Engineering III  
 ApSc 215: Analytical Methods in Engineering V  
 CE 243: Environmental Impact Assessment  
 EAd 221: Environmental Management  
 EAd 222: Energy Management  
 EngS 206: Technology and Human Needs  
 EngS 207: Engineering Climatology  
 EngS 208: Energy Conservation  
 EngS 210: Quantitative Aspects of Social Phenomena  
 EngS 212: Nonrenewable Resources  
 EngS 213: Renewable Resources  
 EngS 242: Materials Recycling and Recovery  
 EngS 270: Theoretical Acoustics I  
 EngS 274: Environmental Noise Control  
 EngS 284: Numerical Methods in Engineering  
 ME 204: Advanced Instrumentation Techniques  
 ME 221: Intermediate Fluid Mechanics  
 ME 224: Fundamentals of Combustion Engines  
 ME 225: Turbomachinery I  
 ME 226: Turbomachinery II  
 ME 227: Viscous Flow  
 ME 235: Compressible Flow  
 ME 237: Propulsion  
 ME 257: Energy Systems Analysis I  
 ME 258: Energy Systems Analysis II  
 ME 259: Solar Heating Systems  
 ME 260: Heating and Air-Conditioning of Buildings  
 ME 261: Air Pollution I  
 ME 262: Air Pollution II  
 ME 264: Air Pollution Seminar  
 ME 267: Power Plant Pollution Control  
 ME 280: Intermediate Thermodynamics  
 ME 281: Advanced Thermodynamics  
 ME 283: Nuclear Reactor Engineering I  
 ME 284: Nuclear Reactor Engineering II  
 ME 287: Heat Conduction  
 ME 290: Kinetic Theory of Gases  
 ME 291-92: Power Systems  
 ME 293: Combustion  
 ME 298: Research  
 ME 299-300: Thesis Research



- ME 312: Theory of Turbulence
- ME 313: Magnetofluidmechanics
- ME 398: Advanced Reading and Research
- ME 399: Dissertation Research
- OR 201: Survey of Operations Research: Deterministic Models

**Note:** All students are expected to have competency in the use of computers. Students who have not taken the required courses for the M.S. degree in the energy program at GWU may be required to take additional courses. M.S. candidates without research experience are encouraged to pursue the thesis option.

### *Energy Technology Option*

Required courses for M.S. degree: ApSc 213; ME 221, 257, 258, 280, 288; EngS 284. Students preparing for the comprehensive examination should be familiar with the material covered in EngS 218 and ME 237.

For professional degree: competency in the areas covered by the courses listed above and EngS 208, 284; ME 259, 260, 291, 292, 298 (6 credits).

For D.Sc. degree: competency in the areas covered by the courses listed above and ApSc 212, 215; ME 227 or 235 or 237, 281, 293. Students preparing for the qualifying examination should be familiar with the material covered in EngS 218 and ME 237.

### **Environmental Engineering**

- ApSc 211: Analytical Methods in Engineering I
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- CE 211: Environmental Chemistry
- CE 212: Open Channel Flow
- CE 213: Hydraulic Structures
- CE 216: Advanced Hydrology
- CE 219: Groundwater and Seepage
- CE 237: Advanced Sanitary Engineering Design
- CE 240: Principles of Environmental Engineering
- CE 241: Water and Wastewater Treatment Processes
- CE 243: Environmental Impact Assessment
- CE 255: Introduction to Ocean and Coastal Engineering
- CE 272: Microbiology for Environmental Engineers
- CE 273: Advanced Treatment Processes
- CE 276: Water Resources Planning and Control
- CE 277: Industrial Waste Treatment
- CE 278: Pollution Transport System
- CE 283: Special Topics in Environmental Engineering
- CE 298: Research
- CE 299-300: Thesis Research
- EngS 242: Materials Recycling and Recovery
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods
- ME 261: Air Pollution I
- ME 262: Air Pollution II
- ME 267: Power Plant Pollution Control

Required courses for M.S. degree: CE 212, 213, 219, 240; ApSc 213 or CE 284.  
For D.Sc. degree: ApSc 213; CE 237, 241, 272.



**Fluid Mechanics and Thermal Sciences**

- ApSc 211: Analytical Methods in Engineering I  
 ApSc 212: Analytical Methods in Engineering II  
 ApSc 213: Analytical Methods in Engineering III  
 ApSc 214: Analytical Methods in Engineering IV  
 ApSc 215: Analytical Methods in Engineering V  
 ApSc 216: Special Topics in Engineering Analysis  
 CE 274: Mechanics of Water Waves  
 EE 133: Electromagnetic Waves and Microwave System Design  
 EE 236: Plasma Dynamics  
 EngS 218: Introduction to Continuum Mechanics  
 EngS 284: Numerical Methods in Engineering  
 EngS 289: Special Topics in Theoretical and Applied Mechanics  
 EngS 315: Introduction to Nonlinear Mechanics of Continua  
 ME 218: Design of Floating and Submerged Marine Vehicles  
 ME 221: Intermediate Fluid Mechanics  
 ME 222: Applied Aerodynamics  
 ME 225: Turbomachinery I  
 ME 226: Turbomachinery II  
 ME 227: Viscous Flow  
 ME 231: Hydrodynamics  
 ME 233: Aeroelasticity I  
 ME 235: Compressible Flow  
 ME 237: Propulsion  
 ME 238: Energetics of Fluid Flow  
 ME 261: Air Pollution I  
 ME 277: Computational Fluid Dynamics  
 ME 280: Intermediate Thermodynamics  
 ME 281: Advanced Thermodynamics  
 ME 287: Heat Conduction  
 ME 288: Convective Heat and Mass Transfer  
 ME 289: Radiative Heat Transfer  
 ME 293: Combustion  
 ME 295: Statistical Thermodynamics  
 ME 297: Special Topics in Fluid Mechanics  
 ME 298: Research  
 ME 299-300: Thesis Research  
 ME 310: Mechanics of Non-Newtonian Fluids  
 ME 311: Nonsteady Flow  
 ME 312: Theory of Turbulence  
 ME 313: Magnetofluidmechanics  
 ME 315: Hypersonic Flow  
 ME 317: Physical Gas Dynamics  
 ME 398: Advanced Reading and Research  
 ME 399: Dissertation Research
- Required courses for M.S. degree: ApSc 211, 213; ME 221, 280, 288 (also ME 227 for nonthesis students).  
 Required courses for professional and D.Sc. degrees: *Fluid Mechanics*—ApSc 212 or 214 or 216, ME 231, 311, 312. *Thermal Sciences*—ApSc 212 or 214 or 216, 215; ME 235, 289.

**Technical Engineering**

- ApSc 211: Analytical Methods in Engineering I  
 ApSc 213: Analytical Methods in Engineering III  
 CE 201: Design of Metal Structures



- CE 202: Design of Reinforced Concrete Structures
- CE 203: Prestressed Concrete Structures
- CE 204: Applied Soil Mechanics I
- CE 205: Applied Soil Mechanics II
- CE 206: Geotechnical Engineering
- CE 207: Soil Dynamics
- CE 208: Rock Engineering
- CE 209: Probabilistic Methods in Geotechnical Engineering
- CE 210: Methods of Structural Analysis
- CE 213: Hydraulic Structures
- CE 214: Design of Dams
- CE 219: Groundwater and Seepage
- CE 221: Pavement and Runway Design
- CE 240: Principles of Environmental Engineering
- CE 255: Introduction to Ocean and Coastal Engineering
- CE 257: Harbor and Coastal Engineering
- CE 258: Application of Probability Methods in Civil Engineering
- CE 265: Special Topics in Geotechnical Engineering
- CE 282: Hydraulic Modeling
- CE 298: Research
- CE 299-300: Thesis Research
- EngS 221: Theory of Elasticity I
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- †Geol 128: Geomorphology
- †Geol 189: Geophysics for Geologists
- †Geol 224: Advanced Structural Geology

Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.  
 For professional degree: CE 207, 208, 209, 219; EngS 221.

### Mechanical Engineering

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- CE 253: Failure and Reliability Analysis of Engineering Structures
- CSci 147: Assembly Language Programming I
- CSci 161: Discrete Structures for Computing
- EE 204: Stochastic Signals and Noise
- EngS 215: Advanced Strength of Materials
- EngS 257: Theory of Vibrations
- EngS 259: Random Vibrations of Structures
- EngS 282: Computer-Aided Design
- EngS 283: Application of Computer Graphics in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- ME 204: Advanced Instrumentation Techniques
- ME 218: Design of Floating and Submerged Marine Vehicles
- ME 221: Intermediate Fluid Mechanics
- ME 224: Fundamentals of Combustion Engines
- ME 225: Turbomachinery I
- ME 226: Turbomachinery II
- ME 227: Viscous Flow
- ME 231: Hydrodynamics
- ME 235: Compressible Flow

†For course description, see the *Undergraduate and Graduate Programs Bulletin*.



- ME 237: Propulsion
- ME 238: Energetics of Fluid Flow
- ME 240: Kinematic Synthesis
- ME 241: Computer Models of Physical and Engineering Systems
- ME 242: Advanced Mechanisms
- ME 243: Advanced Mechanical Engineering Design
- ME 246: Electromechanical Control Systems
- ME 251: Computer-Integrated Manufacturing
- ME 252: Projects in Computer-Integrated Design and Manufacturing
- ME 253: Tribology
- ME 257-58: Energy Systems Analysis I and II
- ME 259: Solar Heating Systems
- ME 260: Heating and Air-Conditioning of Buildings
- ME 261: Air Pollution I
- ME 262: Air Pollution II
- ME 267: Power Plant Pollution Control
- ME 277: Computational Fluid Dynamics
- ME 280: Intermediate Thermodynamics
- ME 281: Advanced Thermodynamics
- ME 283: Nuclear Reactor Engineering I
- ME 284: Nuclear Reactor Engineering II
- ME 286: Special Topics in Mechanical Engineering
- ME 287: Heat Conduction
- ME 288: Convective Heat and Mass Transfer
- ME 289: Radiative Heat Transfer
- ME 291-92: Power Systems
- ME 293: Combustion
- ME 295: Statistical Thermodynamics
- ME 298: Research
- ME 299-300: Thesis Research
- ME 312: Theory of Turbulence

### *Mechanical Engineering Design Option*

Required courses for M.S. degree: ApSc 213 or EngS 284; ME 241, 243, 246.

### *Propulsion Engineering Option*

Required courses for M.S. degree: ApSc 213; ME 221, 237, 241, 293.

### *Robotics Option*

Required courses for M.S. degree: ApSc 212; EngS 284; ME 241, 246.

### *Ocean and Marine Engineering†*

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- CE 210: Methods of Structural Analysis
- CE 212: Open Channel Flow
- CE 253: Reliability Analysis of Engineering Structures
- CE 255: Introduction to Ocean and Coastal Engineering
- CE 256: Coastal Processes
- CE 257: Harbor and Coastal Engineering

† Program or course offered at DTNSRDC, Carderock, Md.



- †CE 271: Theoretical Marine Hydromechanics
- †CE 275: Special Topics in Ocean Engineering
- CE 298: Research
- CE 299-300: Thesis Research
- EngS 228: Physical Oceanography
- EngS 257: Theory of Vibrations
- EngS 260: Random Process Theory in Engineering
- EngS 273: Time Series Analysis
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- ME 204: Advanced Instrumentation Techniques
- †ME 218: Design of Floating and Submerged Marine Vehicles
- ME 221: Intermediate Fluid Mechanics
- ME 227: Viscous Flow
- ME 231: Hydrodynamics
- ME 277: Computational Fluid Dynamics
- ME 280: Intermediate Thermodynamics
- ME 297: Special Topics in Fluid Mechanics
- ME 312: Theory of Turbulence

Required courses for M.S. degree: ApSc 211, 213; CE 210; ME 221, 280.

### Solid Mechanics and Materials Science

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- CE 207: Soil Dynamics
- CE 209: Probabilistic Methods in Geotechnical Engineering
- CE 253: Reliability Analysis of Engineering Structures
- CE 254: Special Topics in Structural Engineering
- CE 261: Analysis of Plates and Shells
- CE 263: Theory of Structural Stability
- EngS 215: Advanced Strength of Materials
- EngS 217: Analytical Mechanics
- EngS 218: Introduction to Continuum Mechanics
- EngS 221: Theory of Elasticity I
- EngS 222: Theory of Elasticity II
- EngS 229: Transformations in Materials
- EngS 230: Deformation of Materials
- EngS 231: Structure of Materials
- EngS 233: Mechanics of Composite Materials
- EngS 234: Composite Materials
- EngS 236: Experimental Techniques in Materials Science
- EngS 237: Environmental Effects on Materials
- EngS 240: Fracture Mechanics
- EngS 241: Failure of Materials
- EngS 249: Special Topics in Materials Science
- EngS 256: Plasticity
- EngS 257: Theory of Vibrations
- EngS 259: Random Vibration of Structures
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics

†Program or course offered at DTNSRDC, Carderock, Md.



- EngS 288: Advanced Finite Element Methods in Structural Mechanics  
 EngS 289: Special Topics in Theoretical and Applied Mechanics  
 EngS 298: Research  
 EngS 299-300: Thesis Research  
 EngS 315: Introduction to Nonlinear Mechanics of Continua  
 EngS 398: Advanced Reading and Research  
 EngS 399: Dissertation Research  
 ME 221: Intermediate Fluid Mechanics  
 ME 280: Intermediate Thermodynamics  
 ME 281: Advanced Thermodynamics  
 ME 295: Statistical Thermodynamics  
 ME 310: Mechanics of Non-Newtonian Fluids  
 †BiSc 272: Scanning Electron Microscopy  
 †Chem 207: Chemical Bonding  
 †Chem 211-12: Physical Chemistry  
 †Chem 213: Chemical Thermodynamics  
 †Geol 113: Crystallography  
 †Phys 167: Principles of Quantum Physics  
 †Phys 168: Applied Quantum Physics  
 †Phys 170: Elementary Solid-State Physics  
 †Phys 211: Advanced Mechanics  
 †Phys 221-22: Quantum Mechanics  
 †Phys 224: Statistical Mechanics  
 †Phys 243: Solid-State Physics: Structure and Binding  
 †Phys 244: Solid-State Physics: Electronic Processes in Metals

#### *Solid Mechanics*

Required courses for M.S. degree: ApSc 211, 213; EngS 218, 231; ME 280.  
 For professional degree: EngS 222, 240, 241, 256, 285.  
 For D.Sc. degree: ApSc 212, 215; EngS 222, 230, 256, 315.

#### *Materials Science*

Required courses for M.S. degree: ApSc 211, 213; EngS 218, 231; ME 280.  
 For professional degree: EngS 234, 237, 240, 241.  
 For D.Sc. degree: ApSc 212; EngS 229, 230; ME 295.

#### *Structural Engineering*

- ApSc 211: Analytical Methods in Engineering I  
 ApSc 212: Analytical Methods in Engineering II  
 ApSc 213: Analytical Methods in Engineering III  
 ApSc 214: Analytical Methods in Engineering IV  
 CE 201: Design of Metal Structures  
 CE 202: Design of Reinforced Concrete Structures  
 CE 203: Prestressed Concrete Structures  
 CE 204: Applied Soil Mechanics I  
 CE 205: Applied Soil Mechanics II  
 CE 206: Geotechnical Engineering  
 CE 207: Soil Dynamics  
 CE 208: Rock Engineering  
 CE 210: Methods of Structural Analysis  
 CE 215: Urban Construction Technology  
 CE 221: Pavement and Runway Design  
 CE 250: Advanced Metal Structures  
 CE 251: Advanced Reinforced Concrete Structures  
 CE 253: Reliability Analysis of Engineering Structures

For course description, see the *Undergraduate and Graduate Programs Bulletin*.



- CE 254: Special Topics in Structural Engineering
- CE 256: Coastal Processes
- CE 257: Harbor and Coastal Engineering
- CE 258: Application of Probability Methods in Civil Engineering
- CE 261: Analysis of Plates and Shells
- CE 263: Theory of Structural Stability
- CE 266: Design to Resist Natural Hazards I: Effects of Extreme Wind
- CE 267: Design to Resist Natural Hazards II: Earthquakes
- CE 298: Research
- CE 299-300: Thesis Research
- CE 398: Advanced Reading and Research
- CE 399: Dissertation Research
- EngS 215: Advanced Strength of Materials
- EngS 218: Introduction to Continuum Mechanics
- EngS 221: Theory of Elasticity I
- EngS 233: Mechanics of Composite Materials
- EngS 234: Composite Materials
- EngS 240: Fracture Mechanics
- EngS 241: Failure of Materials
- EngS 256: Plasticity
- EngS 257: Theory of Vibrations
- EngS 259: Random Vibration of Structures
- EngS 282: Computer-Aided Design
- EngS 283: Application of Computer Graphics in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- EngS 288: Advanced Finite Element Methods in Structural Mechanics

Required courses for M.S. degree: CE 201 or 202, 206, 210; EngS 215, 285.  
 For professional degree: CE 250 or 251; EngS 257 or CE 253; CE 266 or 267; EngS 282 or 288.

For D.Sc. degree: ApSc 212, 213 or 214; EngS 257; CE 254 or EngS 259; EngS 221, 288.

### Structures and Dynamics

- ApSc 211: Analytical Methods in Engineering I
- ApSc 212: Analytical Methods in Engineering II
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- ApSc 216: Special Topics in Engineering Analysis
- †CE 207: Soil Dynamics
- †CE 210: Methods of Structural Analysis
- CE 253: Reliability Analysis of Engineering Structures
- CE 254: Special Topics in Structural Engineering
- CE 258: Application of Probability Methods in Civil Engineering
- CE 261: Analysis of Plates and Shells
- CE 263: Theory of Structural Stability
- †CE 266: Design to Resist Natural Hazards I: Effects of Extreme Wind
- †CE 267: Design to Resist Natural Hazards II: Earthquakes
- †EngS 215: Advanced Strength of Materials
- †EngS 217: Analytical Mechanics
- †EngS 218: Introduction to Continuum Mechanics
- EngS 221: Theory of Elasticity I
- EngS 222: Theory of Elasticity II

†Course offered on campus only.



- †EngS 233: Mechanics of Composite Materials
- EngS 234: Composite Materials
- †EngS 240: Fracture Mechanics
- †EngS 256: Plasticity
- EngS 257: Theory of Vibrations
- EngS 259: Random Vibration of Structures
- †EngS 281: Advanced Programming Techniques for Engineering Problems
- EngS 282: Computer-Aided Design
- EngS 283: Application of Computer Graphics in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- †EngS 286: Analysis and Design of Thin-Walled Structures
- †EngS 287: Automated Design of Complex Structures
- EngS 288: Advanced Finite Element Methods in Structural Mechanics
- EngS 289: Special Topics in Theoretical and Applied Mechanics
- EngS 299-300: Thesis Research
- EngS 314: Advanced Numerical Methods
- †EngS 315: Introduction to Nonlinear Mechanics of Continua
- EngS 398: Advanced Reading and Research
- EngS 399: Dissertation Research
- †ME 233: Aeroelasticity I
- †ME 247: Seminar: Aircraft Design I
- OR 251: Linear Programming
- OR 252: Nonlinear Programming I

#### *Programs on Campus*

- Required courses for M.S. degree: ApSc 213; CE 253 or 258, 261 or 263 or EngS 285; EngS 215, 257.
- For D.Sc. degree: ApSc 212, 214 or 215; EngS 221, 259.

#### *Programs at NASA-Langley Research Center*

- Required courses for M.S. degree: ApSc 213; CE 261 or 263; EngS 221 or 234, 284, 285, 286 or 287.
- For D.Sc. degree: ApSc 214; EngS 281, 288; ME 223.

#### *Water Resources*

##### *Water Resources Engineering Option*

- ApSc 211: Analytical Methods in Engineering I
- ApSc 213: Analytical Methods in Engineering III
- ApSc 214: Analytical Methods in Engineering IV
- ApSc 215: Analytical Methods in Engineering V
- CE 208: Rock Engineering
- CE 212: Open Channel Flow
- CE 213: Hydraulic Structures
- CE 214: Design of Dams
- CE 216: Advanced Hydrology
- CE 219: Groundwater and Seepage
- CE 240: Principles of Environmental Engineering
- CE 243: Environmental Impact Assessment
- CE 255: Introduction to Ocean and Coastal Engineering
- CE 256: Coastal Processes
- CE 273: Advanced Treatment Processes

*Some offered on campus only.*

*Some offered at NASA-Langley Research Center only.*



- CE 274: Mechanics of Water Waves
- CE 276: Water Resources Planning and Control
- CE 278: Pollution Transport System
- CE 281: Special Topics in Water Resources
- CE 282: Hydraulic Modeling
- CE 284: Numerical Methods in Water Resources
- CE 298: Research
- CE 299-300: Thesis Research
- CE 310: Sedimentation Engineering
- CE 311: Mechanics of Alluvial Channels
- CE 312: Advanced Hydraulics
- CE 398: Advanced Reading and Research
- CE 399: Dissertation Research
- EngS 260: Random Process Theory in Engineering
- EngS 284: Numerical Methods in Engineering
- EngS 285: Finite Element Methods in Engineering Mechanics
- ME 221: Intermediate Fluid Mechanics
- ME 227: Viscous Flow
- ME 231: Hydrodynamics
- ME 277: Computational Fluid Dynamics
- ME 312: Theory of Turbulence
- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 273: Discrete Systems Simulation

Required courses for M.S. degree: *Thesis Option*—ApSc 213 or CE 284; CE 212, 213, 282.

*Nonthesis Option*—ApSc 213 or CE 284; CE 212, 213, 219, 240.

For professional and D.Sc. degrees: ApSc 211, 213; CE 282, 312; ME 221.

#### *Water Resources Planning Option*

- ApSc 213: Analytical Methods in Engineering III
- CE 212: Open Channel Flow
- CE 213: Hydraulic Structures
- CE 214: Design of Dams
- CE 216: Advanced Hydrology
- CE 240: Principles of Environmental Engineering
- CE 243: Environmental Impact Assessment
- CE 256: Coastal Processes
- CE 273: Advanced Treatment Processes
- CE 276: Water Resources Planning and Control
- CE 278: Pollution Transport System
- CE 281: Special Topics in Water Resources
- CE 282: Hydraulic Modeling
- CE 284: Numerical Methods in Water Resources
- CE 298: Research
- CE 299-300: Thesis Research
- CE 310: Sedimentation Engineering
- CE 311: Mechanics of Alluvial Channels
- EAd 211-12: Engineering Administration
- EAd 269: Elements of Decision Making and Problem Solving
- EAd 283: Systems Engineering I
- EAd 284: Systems Engineering II
- EngS 206: Technology and Human Needs
- EngS 213: Renewable Resources
- EngS 260: Random Process Theory in Engineering



- EngS 284: Numerical Methods in Engineering  
 ME 221: Intermediate Fluid Mechanics  
 OR 251: Linear Programming  
 OR 252: Nonlinear Programming I  
 OR 253: Integer and Network Programming  
 OR 271: Forecasting Techniques  
 OR 273: Discrete Systems Simulation  
 OR 377: Advanced Stochastic Models in Operations Research  
 †Econ 217-18: Survey of Economics  
 †Econ 235: Energy Resources and Policy  
 †Econ 237: Economics of the Environment and Natural Resources  
 †Geog 222: Seminar: Resources and the Environment  
 †Geog 223: Seminar: The Population-Food Balance  
 †PSc 222: Science, Technology, and Public Affairs

Required courses for M.S. degree: *Thesis Option*—ApSc 213 or CE 284; CE 212, 213, 276.  
*Nonthesis Option*—ApSc 213 or CE 284; CE 212, 213, 219, 240, 276, 280.

## Civil Engineering Graduate Courses

Courses designated "as arranged" are not offered on a regular basis.

- 201 **Design of Metal Structures** (3)  
 Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box-type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)
- 202 **Design of Reinforced Concrete Structures** (3)  
 Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box-type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)
- 203 **Prestressed Concrete Structures** (3)  
 Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)
- 204 **Applied Soil Mechanics I** (3)  
 Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of department. (Spring, even years)
- 205 **Applied Soil Mechanics II** (3)  
 Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of department. (Fall, even years)
- 206 **Geotechnical Engineering** (3)  
 Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of department. (Spring)



- 207 **Soil Dynamics** (3)  
Stress-strain behavior of soil under transient and repeated loads, effects of earthquakes on foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (Fall, odd years)
- 208 **Rock Engineering** (3)  
Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of department. (Fall, odd years)
- 209 **Probabilistic Methods in Geotechnical Engineering** (3)  
Review of probability concepts; probabilistic theory for particulate media; variability of soil properties; applications of reliability analysis to geotechnical problems, such as shallow foundations and soil slopes; decision analysis in geotechnical engineering. (Fall, even years)
- 210 **Methods of Structural Analysis** (3)  
Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)
- 211 **Environmental Chemistry** (3)  
Principles and laboratory operations in environmental chemistry, with primary emphasis on chemistry applicable to water supply, wastewater treatment, and hazardous waste management. Emphasis on advanced analytical techniques, including HPLC, GC, and AA. Prerequisite or concurrent registration: CE 240. (Fall, odd years)
- 212 **Open Channel Flow** (3)  
Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in nonprismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)
- 213 **Hydraulic Engineering** (3)  
Principles and practice of hydraulic design of conveyance, regulating, and measurement structures. Design considerations for spillways, energy dissipators, inlet and outlet works related to dams. Forces acting on hydraulic structure and stability analysis. Selection and operation of hydraulic turbines and pumps. Design considerations for flow through pipes. Flow transients and cavitation. Prerequisite: CE 193 or approval of department. (Spring)
- 214 **Design of Dams** (3)  
Project planning and investigations. Types of dams; design of earth-rock fill dams; stability analysis, foundation treatment, wind-wave protection. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)
- 215 **Urban Construction Technology** (3)  
Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of department. (As arranged)
- 216 **Advanced Hydrology** (3)  
Precipitation, evaporation, and transpiration. Soil physics; stream flow, drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control, water-supply forecasting. Prerequisite: CE 195 or equivalent. (Spring, even years)
- 219 **Groundwater and Seepage** (3)  
Permeability theory of groundwater flow, flow nets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: approval of department. (Spring)
- 220 **Urban Transportation Engineering** (3)  
Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for selecting among alternative solutions. Prerequisite: approval of department. (Fall, odd years)



- 221 **Pavement and Runway Design** (3)  
Pavement types, wheel-load characteristics; stresses in pavements and sub-grades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202, 204 or 205. (Spring, odd years)
- 222 **Stations and Terminals** (3)  
Unified treatment of the functions and operations of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intramodal and intermodal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of department. (Spring, even years)
- 223 **Traffic Engineering** (3)  
Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited-access expressways; examples of traffic control system implementations. Prerequisite: approval of department. (Fall, even years)
- 237 **Advanced Sanitary Engineering Design** (3)  
Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water-supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite or concurrent registration: CE 240, 241. (Fall, even years)
- 240 **Principles of Environmental Engineering** (3)  
(Formerly *Principles of Environmental Engineering I*)  
Basic concepts needed to understand water, air, and terrestrial environments, including the interrelationships among these environments and selected principles of environmental chemistry and microbiology. Assessment of environmental quality and impact; environment and health; regulatory control. Water and wastewater systems. (Fall)
- 241 **Water and Wastewater Treatment Processes** (3)  
(Formerly *Principles of Environmental Engineering II*)  
Theory and application of commonly used processes, including sedimentation, coagulation, filtration, disinfection, gas transfer, softening, ion exchange, activated sludge, trickling filtration, oxidation ponds, sorption, and sludge stabilization and disposal. Process combinations and modifications needed to produce systems that meet specific treatment requirements. (Spring, even years)
- 243 **Environmental Impact Assessment** (3)  
Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies that have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution-control facilities, and industrial and community development. Prerequisite: approval of department. (Fall, odd years)
- 250 **Advanced Metal Structures** (3)  
Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)
- 251 **Advanced Reinforced Concrete Structures** (3)  
Conception, analysis, and design of low-rise and high-rise buildings by ultimate-strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures, and special topics. Prerequisite: CE 202 or equivalent. (Spring)



- 253 **Reliability Analysis of Engineering Structures (3)**  
Probability theory, theory of structural reliability, probabilistic analysis of strength and loads, risk and reliability function, empirical distribution, probability plot. Reliability of structures in the design service life, method of perturbation, Monte Carlo simulation. Fatigue and fracture, proof testing, inspection and repair-replacement maintenance. Prerequisite: approval of department. (Fall, odd years)
- 254 **Special Topics in Structural Engineering (3)**  
Selected problems in structural mechanics and design, such as thermal stresses in structural systems, advanced probabilistic structural mechanics, structural design for dynamic loads, structural design for repeated loads, or advanced structural applications. Topic announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: CE 210 and approval of department. (As arranged)
- 255 **Introduction to Ocean and Coastal Engineering (3)**  
Fundamental aspects of incompressible fluid mechanics and its applications to analysis of wave motions, circulations, and other free surface flows in coastal and offshore regions; wave spectra, water-level fluctuations, tides, tsunamis, oscillations, and storm surges; wind-generated waves, including wave statistics and wave spectra; beaches, sediment transport, wave forces on coastal and offshore structures. Prerequisite: ApSc 115 or equivalent. (Fall)
- 256 **Coastal Processes (3)**  
Coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport in sand dune stabilization, sediment tracing. Prerequisite: CE 255. (Spring, even years)
- 257 **Harbor and Coastal Engineering (3)**  
Applications of principles of ocean and coastal engineering to coastal protection structures, harbor design and navigation, breakwaters, seawalls, quays, docks; sediment transport in the coastal regime, estuaries and deltas; dredging for maintenance of channels and harbors. Prerequisite: CE 255. (Spring, odd years)
- 258 **Application of Probability Methods in Civil Engineering (3)**  
Uncertainty in real-world information; basic probability concepts and models; random variables; useful probability distributions, statistical estimation of distribution parameters from observed data; empirical determination of distribution models; testing hypothesis; regression and correlation analyses; decision theory as applied to engineering problems in structural, geotechnical, hydraulic, transportation, and environmental engineering as well as construction planning and management. (Fall, even years)
- 261 **Analysis of Plates and Shells (3)**  
Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded-plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow-shell theory. Specific applications. Prerequisite: graduate status. (Spring)
- 262 **Design of Plate and Shell Structures (3)**  
Design of long-span plate and shell roof structures in reinforced concrete and metal, design of containers for fluids and granular materials, computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall, alternate years)
- 263 **Theory of Structural Stability (3)**  
General criteria for stability, buckling of elastic and inelastic columns and frames, torsional and lateral buckling, variational methods. Buckling of plates and shells under static loads, stability of stiffened structures, effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)



**265 Special Topics in Geotechnical Engineering (3)**

Selected topics, such as rheology of soils, computer applications, excavating and tunneling, or ocean engineering problems. May be repeated for credit. Prerequisite: approval of department. (As arranged)

**266 Design to Resist Natural Hazards I: Effects of Extreme Wind (3)**

(Formerly *Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I*)

Characterization of winds in hurricanes, tornadoes, and extreme extratropical storms; variation of velocity and direction with elevation; probability and risk. Static wind forces on structures; U.S. and European codes; design of wind-bracing systems. Storm surge and flooding hazards. Aeroelastic effects and vortex action, galloping, flutter. Analysis of sensitive structures for aeroelastic and buffetting effects; approaches to suppression of oscillations. Prerequisite: EngS 257 or approval of department. (Fall, odd years)

**267 Design to Resist Natural Hazards II: Earthquakes (3)**

(Formerly *Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II*)

Origins and characterization of earthquakes, zoning maps, recurrence intervals, and risk assessment. Basic code requirements based on single-degree-of-freedom concepts; earthquake spectra; reserve strength in post-elastic behavior. Response of multiple-story buildings, bracing systems, torsional and P-Delta effects. Response of other types of structures, including bridges, embankments, and utilities. Critique of codes; analysis of random effects; damping systems; base insulation. Integration of natural hazard design. Prerequisite: EngS 257 or approval of department. (Fall, even years)

**271 Theoretical Marine Hydromechanics (3)**

Introductory course. Derivation of the fundamental equations and boundary conditions of fluid media, application of potential-flow theory to fluid motion around two- and three-dimensional bodies, perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of department. Offered off campus only. (As arranged)

**272 Microbiology for Environmental Engineers (3)**

(Formerly *Biological Wastewater Treatment*)

Principles of microbiology and their application to lakes, streams, hazardous-waste problems, and biological treatment systems. Bioassay and other techniques for evaluating the impact of wastewater discharges and hazardous substances on ecological systems. Concepts of limnology, including limiting of nutrients and control of nuisance growths. (Spring, even years)

**273 Advanced Treatment Processes (3)**

(Formerly *Water-Supply Engineering*)

Principles and applications of advanced systems for treating water, wastewater, and hazardous wastes, including nitrification, denitrification, chemical precipitation of phosphorus, biological phosphorus removal, effluent filtration, oxidation-reduction processes, stripping, sorption, incineration, distillation, electrodialysis, and reverse osmosis. Prerequisite: CE 241. (Spring, odd years)

**274 Mechanics of Water Waves (3)**

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state of the art based on correlation between theory and measurements. Wave breaking and reflexion. Prerequisite: ApSc 213 or equivalent and permission of instructor. (Fall, even years)

**275 Special Topics in Ocean Engineering (3)**

Selected topics, such as marine aspects of viscous-flow theory, interfacial (internal) waves, or applied random processes in ocean and coastal engineering. May be repeated for credit. Prerequisite: approval of department. (As arranged)



- 276 **Water Resources Planning and Control** (3)  
The parameters of water resources planning and control, economics of water resources and related natural resources, economics of water-quality control, physical parameters of water resource development, water resources law. Prerequisite: approval of department. (Fall, even years)
- 277 **Industrial Waste Treatment** (3)  
The nature of industry and waste generation, industrial waste characteristics, waste measurements, techniques used in industrial waste treatment and control, nuclear waste control, reuse of industrial effluents and sewage for industrial process water, problems associated with treatment sewage for industrial process water and disposal of industrial wastes and their effects on receiving waters. Prerequisite or concurrent registration: CE 240. (Fall, odd years)
- 278 **Pollution Transport System** (3)  
Distribution of pollutants in natural waters and atmosphere, diffusive and advective transport, mathematics for stream pollutant deoxygenation rates, groundwater pollution transport, sediment transport, thermal transport, numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall, even years)
- 279 **Management of Hazardous Wastes** (3)  
Federal regulations governing management of hazardous wastes, including the Resource Conservation and Recovery Act (RCRA) and Superfund legislation. Groundwater monitoring, treatment, and recovery systems; geophysical investigations; landfill design; barrier walls; emerging treatment technologies; risk-assessment methods. Case histories are used to illustrate legal aspects, the permit process, and enforcement methods. Prerequisite: approval of department. (Spring, odd years)
- 281 **Special Topics in Water Resources** (3)  
Morphometric properties of drainage basins, drainage network analysis, hydraulic geometry of streams, advanced hydraulics of alluvial channels, modeling of drainage basins, computer applications, stochastic hydrology. Prerequisite: approval of department. (As arranged)
- 282 **Hydraulic Modeling** (3)  
Dimensional analysis and similitude. Types of models—physical, mathematical. Distortions in physical models. Erodible bed models. Prerequisite: CE 193. (Fall, alternate years)
- 283 **Special Topics in Environmental Engineering** (3)  
Selected topics, such as public health engineering, sludge treatment and disposal, advanced chemistry for environmental engineers. (As arranged)
- 284 **Numerical Methods in Water Resources** (3)  
Use of microcomputers in water resources. Elements of finite difference schemes, basic operations, convergence, stability, and consistency. Nonuniform flow and error analysis; unsteady laminar flow; diffusion problems; unsteady flow in open channels; water hammer, seepage flow, and diffusion-dispersion problems. Prerequisite: approval of department. (Spring)
- 298 **Research** (arr.)  
Basic research projects, as arranged. May be repeated for credit. (Fall and Spring)
- 299–300 **Thesis Research** (3–3)  
(Fall and Spring)
- 310 **Sedimentation Engineering** (3)  
Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of department. (Fall, odd years)
- 311 **Mechanics of Alluvial Channels** (3)  
Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of department. (Spring, odd years)



**312 Advanced Hydraulics (3)**

Theory of unsteady flow. Diffusion and dispersion through pipes and open channels. Numerical solutions using finite element and finite difference methods. Prerequisite: CE 212 or approval of department. (Spring)

**398 Advanced Reading and Research (arr.)**

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

**399 Dissertation Research (arr.)**

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

## Mechanical Engineering Graduate Courses

Courses designated "as arranged" are not offered on a regular basis. An asterisk indicates that a course is offered at NASA-Langley Research Center and may be offered on campus when arranged.

**\*201 Computational Fluid Dynamics Laboratory (1)**

Development of computer programs for solving fluid dynamics problems for incompressible and compressible inviscid and viscous flows. Prerequisite or concurrent registration: ME 277. (As arranged)

**\*202 Computational Aerodynamics Laboratory (1)**

Use of computational aerodynamics methods for conducting engineering studies of practical low-speed, transonic, and high-speed flows. Prerequisite or concurrent registration: ME 222. (As arranged)

**\*203 Experimental Techniques in Aerodynamics (3)**

The wind tunnel, instrumentation devices, boundary corrections, testing procedures, data reduction; laboratory experiments including calibration of instruments, test-section calibrations, and two-dimensional and three-dimensional model tests. Prerequisite: approval of department. (As arranged)

**204 Advanced Instrumentation Techniques (3)**

Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of department. (Fall, odd years)

**\*208 Research in Computational Fluid Dynamics (1 to 3)**

Specific research projects in conjunction with experimental laboratory course or computational labs. Prerequisite: approval of department. (As arranged)

**218 Design of Floating and Submerged Marine Vehicles (3)**

Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action; structural considerations. Prerequisite: EngS 228. (As arranged)

**221 Intermediate Fluid Mechanics (3)**

Continuum, kinematics of fluids; stress and strain tensors; fundamental equations of viscous compressible flows. Irrotational flows and Laplace's equations; source, sinks, doublets, and vortices. Complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of department. (Fall)

**222 Applied Aerodynamics (3)**

Introduction to practical and computational methods for solving two-dimensional and three-dimensional aerodynamics problems. Linear methods, nonlinear potential methods, coordinate transforms, and boundary-layer methods. Prerequisite: EngS 284, ME 221. (As arranged)

**224 Fundamentals of Combustion Engines (3)**

Classification of combustion engines. Air cycles, vapor cycles, external- and internal-combustion engines; rotary engines, reciprocating engines, and turbo-



machinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis, status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of department.  
(As arranged)

**225 Turbomachinery I (3)**

Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

**226 Turbomachinery II (3)**

Aerodynamics of aerofoils, flow in cascades, axial-compressor and axial-turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas-turbine combustion chamber design. Prerequisite: ME 225. (Spring)

**227 Viscous Flow (3)**

Exact solutions of Navier-Stokes equations; the small Reynolds number flows, laminar boundary-layer theory, stability and separation. Reynolds stresses and turbulence; internal, boundary-layer, and mixing flows. Applications to heat and mass transfer and to reacting flows. Prerequisite: ApSc 213, ME 221 or equivalent. (Fall, even years)

**231 Hydrodynamics (3)**

Flow at large Reynolds numbers; inviscid flows in two and three dimensions and irrotational flow theory; conformal mapping and applications. Helmholtz theorems and vorticity dynamics. Applications, such as finite wing theory, instabilities, and large coherent structures. Free surface flow, Froude numbers, sheet vortex. Prerequisite: ME 221 or equivalent. (Spring)

**\*233 Aeroelasticity I (3)**

Introduction to aeroelastic phenomena. Structural deformations of vehicles under static and dynamic loads. Vibrations of vehicle structures. Static aeroelastic problems (structural deformation, divergence control effectiveness, and reversal). Flutter theory and calculation of flutter boundaries. Aerodynamics of steady and nonsteady two-dimensional wings in subsonic, sonic, and supersonic flow. Strip theory applications of two-dimensional aerodynamics to three-dimensional lifting surfaces. Piston and Newtonian-flow theories. Prerequisite: EngS 257, ME 221; or equivalent. (As arranged)

**\*234 Aeroelasticity II (3)**

Brief review of potential-flow theory. Steady and oscillating three-dimensional planar and nonplanar lifting surfaces in subsonic and supersonic flow: theoretical and numerical development (acceleration potential, velocity potential, continuous-load and discrete-load methods, wings with deflected or oscillating control surfaces. General time-dependent motion of arbitrary configurations in subsonic and supersonic flow. Transonic unsteady aerodynamics of three-dimensional lifting surfaces. Dynamic response of aircraft to atmospheric turbulence. Aeroelasticity in structural design. Prerequisite: ME 233. (As arranged)

**235 Compressible Flow (3)**

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small-perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock-wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213, ME 221 or equivalent. (Spring, even years)

**237 Propulsion (3)**

Basic concepts of propulsion: energy transformations in propulsive flows, gas dynamics of combustion and detonation processes, nonuniform flows and mix-



ing, intakes and additive drag, mechanics of flow induction, drag and thrust generation, multiple-flow thrust generators, thrust recovery and augmentation, and the propulsion spectrum. Examples taken from propellers, turbojets, turbofans, ramjets, and rockets. Prerequisite: ME 155. (Spring)

238 **Energetics of Fluid Flow** (3)

Classification of fluids and criteria for identifying flow regimes: continuum, rarefied, relativistic, and quantum flows. Dimensional analysis and similitude. Derivation of species conservation equations, including cases in which external body forces are applied, such as magnetofluid-mechanics. High-speed chemically reacting flows: aerothermochemistry. Introduction to computational fluid dynamics. Prerequisite: ApSc 213, ME 221. (As arranged)

240 **Kinematic Synthesis** (3)

Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project. Prerequisite: ME 190 or equivalent. (Spring, even years)

241 **Computer Models of Physical and Engineering Systems** (3)

Reduction of physical and engineering systems to simplified physical and mathematical models. Manipulation of models using PASCAL programming. Representation of systems using such techniques as linear graphs, networks, analogs, logical operators, and reticular geometry. Numerical algorithms for optimization, graph identification, mini-sum arithmetic, and searching. Styles of problem solving. Prerequisite: ME 117. (Spring)

242 **Advanced Mechanisms** (3)

Emphasis on spatial kinematics, with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. (Spring, odd years)

243 **Advanced Mechanical Engineering Design** (3)

Design of mechanical engineering systems and components, requiring the integration of engineering disciplines at an advanced level. Emphasis on use of computer-aided design (CAD) methods, including computer graphics and finite element analysis, and completion of a design project. Prerequisite: approval of department. (Fall)

246 **Electromechanical Control Systems** (3)

Advanced techniques for system synthesis, compensation, and stabilization. Linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Time domain analysis and synthesis using state space methods and matrix differential equation techniques. Introduction to digital control theory and its applications. Prerequisite: ME 182 or equivalent. (Fall)

247 **Seminar: Aircraft Design I** (3)

Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of department. (As arranged)

248 **Seminar: Aircraft Design II** (3)

Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design trade-offs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of department. (As arranged)



- \*249 Spacecraft Design (3)**  
Computer-aided design of spacecraft and satellites to meet specific mission requirements. Environment, propulsion, structure, heat transfer, orbital mechanics, control considerations. Use of modern computer codes for design studies. Prerequisite: approval of department. (As arranged)
- \*250 Launch Vehicle Design (3)**  
Computer-aided design of hypersonic launch vehicles to meet specific mission requirements. Propulsion, structures, flight path, aerothermochemistry, control considerations. Use of modern computer codes for design studies. Prerequisite: approval of department. (As arranged)
- 251 Computer-Integrated Manufacturing (3)**  
Automation techniques for the processing of metals, polymers, and composite materials. Survey of computer technology, computer graphics and solid modeling, data structures, computer-assisted analysis and optimization. Use of sensing and process modeling to control machining, forming, injection-molding, and welding processes. Numerical control and robot programming, applications and limitations. Program verification techniques. System-integration, scheduling, and tool-management strategies in the computer-integrated factory. Micro- and macro-social and economic considerations in the introduction of computer-integrated manufacturing. Prerequisite: ME 192 or equivalent. (Fall)
- 252 Projects in Computer-Integrated Design and Manufacturing (3)**  
Application of the concepts of computer-integrated manufacturing to group projects, culminating in written and oral presentations. Use of a computer-aided design (CAD) system to specify the geometry of mechanical components. Generation of path instructions for numerically controlled (NC) machine tools to produce useful components. Robot programming, fixturing, and applications in materials handling, machining, and assembly. Factory simulation, part scheduling, and NC program-verification algorithms. Prerequisite: ME 251. (Spring)
- 253 Tribology (3)**  
Fundamentals of the friction, wear, and lubrication of metals, polymers, ceramics, and composite materials. Theories of the friction and wear of materials, techniques for the physical and chemical characterization of surfaces. Wear coatings, boundary and solid lubrication. Tribological problems in the processing of metals and in the application of ceramic components. Prerequisite: CE 166 or equivalent. (As arranged)
- 255 Urban Transportation Technology (3)**  
Introduction to technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life-cycle costs, and measures of system effectiveness. Prerequisite: approval of department. (As arranged)
- 257-58 Energy Systems Analysis I-II (3-3)**  
Application of diverse energy analytic techniques to a variety of energy systems, devices, and processes. Solar photovoltaics, fuel cells; tidal, geothermal, wind energy conversion; controlled thermonuclear fusion and magnetohydrodynamics. Synthesis of fuels and structural aspects of electric utilities and their relation to decentralized energy. Coupled issues, such as food-energy, population-energy, and transportation-information. Analytical methods applied to these technologies: hands-on machine literature searching; supply and demand forecasting, including Delphi, scenario writing, linear and multiple statistical regression analysis; data interpretation of extremal statistics applied to the design of wind electric generators; input-output analysis; net-energy analysis; life-cycle costing; second-law (exergy) analysis; technological assessment; mathematical modeling of energy systems and computer-assisted synthesis (CAS). It is recommended that ME 257-58 be taken in sequence. Prerequisite: approval of department. (Academic year)



- 259 **Solar Heating Systems (3)**  
Fundamentals of solar radiation; methods of solar energy collection and storage. Theory of flat-plate collectors, solar energy system analysis, design of solar water-heating and space-heating systems, economics of solar heating systems. Passive solar heating systems. Solar industrial process heat. Prerequisite: ME 187 or equivalent. (Fall)
- 260 **Heating and Air-Conditioning of Buildings (3)**  
Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air-conditioning systems; all-air, air-and-water, all-water, and central-control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)
- 261 **Air Pollution I (3)**  
Introductory course on the generation, monitoring, and control of air pollution. Atmospheric pollutants; current levels and health problems. Combustion chemistry and mixing. Application to automobile and power plant controls. Photochemical processes; smog and measurements. Atmospheric dispersion; inversion and acid rain. Prerequisite: approval of department. (Fall, odd years)
- 262 **Air Pollution II (3)**  
Trends in the design of nonpolluting automotive sources. Atmospheric pollution diffusion and long-term chemical evolution. Weather interaction. Diagnostic techniques and remote sensing. Air pollution standards. Noise control. Prerequisite: ME 261 or equivalent. (Spring, even years)
- 267 **Power Plant Pollution Control (3)**  
The control of existing emissions from stationary sources. Aerosol controls; sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Waste disposal. Alternative power systems and future design concepts. Thermal pollution. Prerequisite: ME 261 or equivalent. (Fall, even years)
- \*269 **Wind Tunnel Research Techniques (3)**  
A comprehensive survey of wind tunnel research facilities and techniques. Subsonic, transonic, supersonic, and hypersonic facilities. Basic principles of wind tunnel design; associated research equipment, including models, balances, instrumentation, and flow-visualization techniques. Data acquisition and reduction, research methods, static and dynamic testing techniques, powered-model testing, typical research data, significant research contributions. Prerequisite: approval of department. (Spring)
- 270 **Aerodynamics of Flight Vehicles (3)**  
Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: approval of department. (Spring)
- \*271 **VTOL Aircraft Technology (3)**  
Fundamental principles of VTOL aircraft. Hovering performance based on momentum theory, analysis of jet-induced interference effects, transition aerodynamics, theoretical stability and control and correlation with flight data, ground-effect theory and experiment, handling-qualities criteria, elements of instrument approach and landing problem. Prerequisite: approval of department. (Spring)
- \*272 **Powered-Lift Technology (3)**  
Basic principles of powered-lift aircraft. High-lift aerodynamics, low-speed stability and control, fundamentals of internally blown and externally blown powered-lift concepts, the spanwise blowing scheme to delay wing stall. Use of powered-lift for improved maneuverability of fighter aircraft, aerodynamic ground effects, alleviation of noise of powered-lift systems, aerodynamic loads associated with blown flaps. Prerequisite: approval of department. (Fall)



- \*273 Principles of Automatic Flight Control (3)**  
Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of department. (Spring)
- \*274 Principles of Flight Guidance (3)**  
Guidance requirements for atmospheric flight. Implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)
- 275 Stability and Control of Vehicles (3)**  
Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency-response analysis. Prerequisite: approval of department. (Fall)
- 276 Mechanics of Space Flight (3)**  
Two-body problems, including orbital elements, universal variables, orbit determination, Kepler's equations, orbit transfers, and Lambert's theorem. Orbital perturbation, variation of parameters, drag and oblateness effects. Prerequisite: EngS 217. (As arranged)
- 277 Computational Fluid Dynamics (3)**  
Theory of discrete methods for solving the governing equations of fluid dynamics. Potential flow, Euler equations, Navier-Stokes equations. Emphasis on algorithm development appropriate to modern supercomputers. Prerequisite: EngS 284, ME 221. (As arranged)
- \*279 Special Topics in Flight Sciences (3)**
- 280 Intermediate Thermodynamics (3)**  
Macroscopic and microscopic descriptions of thermodynamic systems. Fundamental equation; conditions of equilibrium and stability of thermodynamic systems. Review of methods of statistical thermodynamics, microstate, macrostate, and thermodynamic probability. Classical and quantum statistics. Properties of perfect gases and crystals. Review of elements of kinetic theory and transport phenomena. Chemical equilibrium and selected applications. Prerequisite: approval of department. (Fall)
- 281 Advanced Thermodynamics (3)**  
The concept of ensembles; Boltzmann, Fermi-Dirac, and Bose-Einstein statistics; balance and entropy-production equations. Presentation of linear, nonequilibrium thermodynamics, using Onsager's reciprocity relations. Prigogine's nonlinear, nonequilibrium thermodynamics. Consideration of Benard instability and fluctuation theory, using the formulation of Haken; bifurcation and catastrophe theories. Integration of subjects using information theory; computational techniques to determine thermophysical properties. Prerequisite: ME 280 or equivalent. (Spring)
- 283 Nuclear Reactor Engineering I (3)**  
World energy resources and the importance of fission energy. Atomic and nuclear structure, nuclear fission and chain reaction, critical mass. Nuclear reactor classification, history of reactor development. Nuclear reactions and radiation; radioactive decay; radiation detection, hazards, and protection. Neutron reactions, neutron diffusion and slowing down, the criticality condition. Reflected reactors, homogeneous and heterogeneous reactor systems, transient reactor behavior and control, description of pressurized and boiling water reactors, other reactor systems. Environmental considerations, reactor safety. Prerequisite: approval of department. (As arranged)
- 284 Nuclear Reactor Engineering II (3)**  
Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor material problems. Reactor fuels, shielding, mechanical and structural components. Preliminary reactor design, fuel cycles, nuclear reactor systems, engineered safety systems. The economics of nuclear power. Prerequisite: ME 283. (As arranged)



- \*285 **Reaction Kinetics** (3)  
Theoretical aspects of kinetics of homogeneous and heterogeneous reactions in gaseous and liquid systems. Prerequisite: ME 280. (As arranged)
- 286 **Special Topics in Mechanical Engineering** (3)  
Prerequisite: approval of department. (As arranged)
- 287 **Heat Conduction** (3)  
Conduction of heat through solid, liquid, and gaseous media. Formulation and methods of analytical, numerical, and analog solutions. Steady two- and three-dimensional problems, problems in unsteady heat conduction. Conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall, odd years)
- 288 **Convective Heat and Mass Transfer** (3)  
Heat and momentum transfer in laminar and turbulent flow. Application of boundary-layer theory to problems of forced convection. The laminar boundary-layer and similarity solutions. Heat convection in turbulent flow, momentum-heat transfer analogy. The influence of temperature-dependent fluid properties. Convective heat transfer at high velocities, mass transfer, formulation of a simplified theory. Some solutions to the conserved-property equation. Prerequisite: ME 221 or equivalent. (Spring, odd years)
- 289 **Radiative Heat Transfer** (3)  
Nature of thermal radiation; laws of intensity attenuation and generation. Solid angles and frequency spectrum: flames, solar ponds, beam energy transmission. Surface properties and view factors: design of furnaces and radiant boilers. Radiation vs. convection processes: reentry, lasers. Applications to optical temperature diagnostics; emission, absorption, and scattering techniques; remote sensing. Prerequisite: approval of department. (Fall, even years)
- 290 **Kinetic Theory of Gases** (3)  
Equation of state and physical properties for gas composed of discrete particles, relation of kinetic theory to thermodynamics, Maxwell distribution of molecular velocities, Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (As arranged)
- 91-92 **Power Systems** (3-3)  
Design of thermal power system components and system optimization. Steam-cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)
- 293 **Combustion** (3)  
Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of department. (Spring, even years)
- 295 **Statistical Thermodynamics** (3)  
Distribution functions; Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces; perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280. (As arranged)
- 296 **Special Topics in Heat and Mass Transfer** (3)  
Prerequisite: approval of department. (As arranged)
- 297 **Special Topics in Fluid Mechanics** (3)  
Prerequisite: approval of department. (As arranged)



- 298 **Research** (arr.)  
Research as arranged. May be repeated for credit. (Fall and Spring)
- 299-300 **Thesis Research** (3-3)  
(Fall and Spring)
- 310 **Mechanics of Non-Newtonian Fluids** (3)  
Classification of fluids, physical properties of composite fluids, convected coordinate systems, fundamentals of constitutive equations of composite fluids. Purely viscous fluids, Reiner and Rivlin theories, power-law fluids. Linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscoelasticity. Nonlinear theory of viscoelasticity, Rivlin-Ericksen theory. Viscoplastic fluids, Bingham plastic fluids, Oldroyd's analysis. Viscometry and rheogoniometry, turbulent flow of suspensions and emulsions in pipes, fractional drag reduction by polymeric additives. Prerequisite: approval of department. (As arranged)
- 311 **Nonsteady Flow** (3)  
Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves, initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gas dynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or 237, or equivalent. (As arranged)
- 312 **Theory of Turbulence** (3)  
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospheric environment and effects on air pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (As arranged)
- 313 **Magnetofluidmechanics** (3)  
Thermodynamics and fluid mechanics of electrically conducting liquids and gases, theory and applications. Thermodynamics and transport properties of plasmas formulated, reaction kinetics and plasma reactions. Fundamental equations (mass, momentum, and energy) of magnetofluidmechanics. Flow with infinite and finite conductivity, Alfvén waves and wave phenomena, flow with heat transfer and friction. Relativistic magnetofluidmechanics, dimensional analysis and scaling parameters. Applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)
- 315 **Hypersonic Flow** (3)  
Shock waves in hypersonic limits, one-dimensional piston problem, and method of characteristics. Hypersonic small-disturbance theory and exact solutions. Unsteady analogy and similarity parameters. Newtonian flow theory for slender and blunt bodies. Tangent wedge/cone approximation and shock-expansion theory. Delta wing problems. Hypersonic viscous interaction phenomena and real-gas effects. Features of hypersonic boundary layers and local similarity approximations. Prerequisite: ApSc 211, ME 235. (As arranged)
- 317 **Physical Gas Dynamics** (3)  
Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235, 295 or equivalent. (As arranged)
- 398 **Advanced Reading and Research** (arr.)  
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)



## Engineering Science Graduate Courses

Courses designated "As arranged" are not offered on a regular basis. An asterisk indicates that a course is offered at NASA-Langley Research Center and may be offered on campus when arranged.

- 206 **Technology and Human Needs** (3)  
Sociology of science and engineering. Social consequences of modern technology, including energy systems, environmental issues, transportation, communications biomechanics, and the use of computers in conjunction with it. Institutional barriers and incentives to socioeconomic progress made possible by high technology. Prerequisite: approval of department. (As arranged)
- 207 **Engineering Climatology** (3)  
Constitution of physical properties of Earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of department. (As arranged)
- 208 **Energy Conservation** (3)  
Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, and in industrial, manufacturing, and commercial sectors. Second law of thermo-dynamics from a conservation viewpoint. Construction methods for low energy consumption in large and small edifices. Environmental effects and low fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of department. (As arranged)
- 210 **Quantitative Aspects of Social Phenomena** (3)  
Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Comparison of deterministic and stochastic analysis. Population growth, birth and death rates, population diffusion, Lancaster equation, Richardson's approach, the Forrester-Meadows model. Kinetic theory formulation of peaceful coexistence. Probability distributions, characteristic functions, and central-limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermo-dynamic approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of department. (As arranged)
- 212 **Nonrenewable Resources** (3)  
Nonrenewable fossil and fissile fuel resources. The interplay of geology, engineering applications, and economics. Fossil fuels include coal, petroleum, natural gas, shale; fissile fuels include uranium and thorium. Exploration, excavation, production, and processing. Conversion techniques from solid to liquid and gaseous fuels. Environmental impacts and supply-demand issues. Prerequisite: ME 257 or approval of department. (As arranged)
- 213 **Renewable Resources** (3)  
Renewable energy resources, or those believed to be of practically indefinite duration. Solar energy aspects, excluding solar heating of buildings. Biomass, including food, fiber, and photosynthesis. Biological and chemical processes, pyrolysis, enzymatic hydrolysis, and hydrogenation. Solar photovoltaics, wind energy conversion systems, ocean thermal energy conversion, tidal energy, geothermal energy. Central vs. distributed energy systems. Prerequisite: ME 257 and 258 are desirable, or approval of department. (As arranged)
- 214 **Geothermal Energy** (3)  
Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of department. (As arranged)



- 215 **Advanced Strength of Materials** (3)  
Deflection of beams using singular functions, unsymmetrical bending of beams, beams on elastic foundation. Beam-column problems, shear center for thin-walled beam cross sections, curve beams. Applications of energy methods, torsion, basic equations for theory of elasticity, thin- and thick-walled cylinders, stress concentration, failure criteria and elastic-plastic analysis of beams under bending and torsion. Prerequisite: CE 120. (Spring)
- 217 **Analytical Mechanics** (3)  
Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of department. (As arranged)
- 218 **Introduction to Continuum Mechanics** (3)  
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of department. (Fall)
- 221 **Theory of Elasticity I** (3)  
Review of basic concepts and equations, formulation of boundary-value problems, variational principles, general torsion and bending of prismatical rods, solution of plane problems using complex analysis. Prerequisite: ApSc 211, EngS 215 or 218. (Spring)
- 222 **Theory of Elasticity II** (3)  
Three-dimensional elastostatics, thermoelasticity, and introduction to elastic wave propagation. Prerequisite: EngS 221. Prerequisite or concurrent registration: ApSc 215. (Fall, odd years)
- 228 **Physical Oceanography** (3)  
Seawater, equations of motion, interaction between air and sea, currents, wind waves in deep and shallow waters, long ocean waves, tides, wave statistics, sea ice. Prerequisite: ME 221 or equivalent. (As arranged)
- 229 **Transformations in Materials** (3)  
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: CE 140, ME 280. (Spring, odd years)
- 230 **Deformation of Materials** (3)  
Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening. Prerequisite: CE 166, EngS 218. (Fall, odd years)
- 231 **Structure of Materials** (3)  
Introduction to bonding types, including covalent, metallic, and ionic. Crystallography, elastic properties of crystals, crystal defects, thermodynamics of solids, crystal defect interactions, solid solutions, intermediate compounds, defect clusters, grain boundaries, phase boundaries, and surfaces. Modeling techniques for solids, including molecular dynamics, Monte Carlo, and quantum theory of free and tightly bound electrons in solids. Prerequisite: CE 140. (Fall)
- 233 **Mechanics of Composite Materials** (3)  
Stress-strain relationship for orthotropic materials, invariant properties of an orthotropic lamina, biaxial strength theory for an orthotropic lamina. Mechanics of materials approach to stiffness, elasticity approach to stiffness. Classical lamination theory, strength of laminates. Statistical theory of fatigue damage for composites. Prerequisite: approval of department. (Spring, odd years)
- 234 **Composite Materials** (3)  
Principles of composites and composite reinforcement. Micromechanics and failure, interface reactions in various composites, reinforcing materials. Structure of composites: fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of department. (Spring, even years)



- 236 **Experimental Techniques in Materials Science** (3)  
Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray diffraction including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy, including electron optics, image formation, and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: EngS 231. (Spring, odd years)
- 237 **Environmental Effects on Materials** (3)  
Aqueous corrosion, electrochemistry, electrochemical reactions, polarization. Environmental factors, intergranular corrosion, stress corrosion, high-temperature corrosion. Kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of department. (Fall, even years)
- \*239 **Physical Ceramics** (3)  
Crystal chemistry and the systematic study of the structure of ceramic materials. Solid reactions occurring at elevated temperatures. Sintering vitrification, diffusional mechanisms and effects. Reaction rate theory. Elastic, anelastic, and plastic properties of ionic and covalent solids. Viscoelastic behavior of vitreous and vitreous-solid systems. Phase equilibria of ceramic systems. Prerequisite: approval of department. (As arranged)
- 240 **Fracture Mechanics** (3)  
Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture. Linear elastic systems, plasticity considerations, fracture toughness. Engineering analysis, notch-strength analysis with limit approach, crack-propagation laws, fatigue, fracture testing. Comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)
- 241 **Failure of Materials** (3)  
Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation, polymer deformation, fracture, Griffith theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low-cycle fatigue, failure analysis. Prerequisite: CE 166. (Fall, odd years)
- 242 **Materials Recycling and Recovery** (3)  
Techniques and technologies for recovering and reusing waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of department. (As arranged)
- 249 **Special Topics in Materials Science** (3)  
Prerequisite: approval of department. (As arranged)
- 256 **Plasticity** (3)  
Introduction to the continuum theory of plastic deformation. Physical basis of rate-independent plasticity. Concepts of yield, strain hardening and softening, reverse yield, and cyclic plasticity. Constitutive equations describing plastic deformation, formulation and exact solution of one-dimensional problems, full-field formulation of multidimensional problems. Stability of plastically deformed media. Elastic-plastic wave propagation. Prerequisite: EngS 215 or 218. (Spring, odd years)
- 257 **Theory of Vibrations**  
Damped and undamped natural vibration, response of single- and multiple-degrees-of-freedom systems to steady-state and transient excitations, modal analysis, nonproportional damping and complex modes, variation formulation of equations of motion, discretization of structural systems for vibrational analysis. Prerequisite: approval of department. (Fall)
- 258 **Structural Dynamics** (3)  
Vibration of continuous systems: membranes, beam plates, and shells; approximate methods of vibration analysis; method of integral transform; analysis of



nonlinear systems; wave propagation. Prerequisite: EngS 257 or approval of department. (Fall, odd years)

**259 Random Vibration of Structures (3)**

Introduction to random processes, responses of linear structures to stationary and nonstationary random inputs. Structural responses to earthquakes, waves, boundary-layer turbulences, wind loads, etc. Failure analysis of structures under random loads. First passage failure, fatigue, stress corrosion, and crack propagation under random stress histories. Prerequisite: ApSc 115 or CE 258. Prerequisite or concurrent registration: EngS 257. (Spring, even years)

**260 Random Process Theory in Engineering (3)**

Spectral analysis, linear system, the superposition principle. Statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values. Statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

**270 Theoretical Acoustics I (3)**

Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ApSc 213, ME 221; or equivalent. (As arranged)

**271 Random Process Theory I (3)**

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction, and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of department. (As arranged)

**272 Random Process Theory II (3)**

Discrete and continuous state Markov processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in engineering problems; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 259 or 260 or 271. (As arranged)

**\*273 Time Series Analysis (3)**

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; coherence; modern techniques for spectral estimation, including periodogram, Blackman-Tukey, direct filtering, maximum entropy, and maximum likelihood; fast Fourier transform and zoom FFT; effects of finite length and digitization on bias and variability; spectral analysis with randomly sampled data; digital filtering; applications in modern technology. Prerequisite: EngS 271 or approval of department. (As arranged)

**274 Environmental Noise Control (3)**

Introduction to the physical effects of noise and vibration on humans, practical sources of noise and their control. Building, ventilation-system, mechanical-equipment, aircraft, automobile, and truck noise. Factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

**\*275 Theoretical Acoustics II (3)**

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to coustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

**\*276 Acoustical and Mechanical Measurements (3)**

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)



**\*277 Physical Acoustics (3)**

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

**\*278 Psychological and Physiological Acoustics (3)**

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of department. (As arranged)

**\*279 Human Factors in Engineering (3)**

Human-machine interface, effects of physical stress on human behavior and performance, life-support system, learning and conditioning of physical stress. (As arranged)

**\*280 Special Topics in Acoustics (3)**

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of department. (As arranged)

**\*281 Advanced Programming Techniques for Engineering Problems (3)**

Techniques for efficient construction of computer programs for engineering systems with emphasis on fundamental structured programming principles. Effects of CPU organization and other hardware features of computer systems on numerical computations involved in engineering systems. Organization and management of data bases for large engineering systems. Use of computer graphics. Prerequisite: approval of department. (As arranged)

**282 Computer-Aided Design (3)**

Fundamental concepts in the development of computational algorithms for the design of structures, machine components and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote-access computer terminals. General-purpose computer programs for engineering analysis and design. Students, individually or in groups, develop a small-scale, general-purpose design program in an appropriate area, such as structural design, machine design, urban planning, or environmental quality control. Prerequisite: EE 51 and CE 210, or equivalent, and approval of department. (Fall)

**283 Application of Computer Graphics in Engineering (3)**

Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic-plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent; or concurrent registration: EngS 284. (Spring)

**284 Numerical Methods in Engineering (3)**

Brief review of basic concepts of numerical analysis. Eigenvalue problems. Numerical solution of systems of equations and ordinary differential equations. Solution techniques for elliptic, parabolic, and hyperbolic partial differential equations. Numerical methods for solving finite element equations. Introduction to solution of fluid-flow problems. Prerequisite: CE 117 or ME 117, or approval of department. (Fall)

**285 Finite Element Methods in Engineering Mechanics (3)**

Calculus of variations. Variational formulation of the finite element method. Techniques of constructing and assembling characteristic element matrices.



- Rayleigh-Ritz method. Galerkin method. Application to problems in structural mechanics, fluid mechanics, heat flow, and solid mechanics. Computer implementation of the finite element method. Convergence characteristics. Prerequisite: approval of department. (Spring)
- \*286 **Analysis and Design of Thin-Walled Structures (3)**  
Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures. Strength and stiffness of locally buckled stiffened structures. Classification of loads and safety factors. Considerations governing the design of thin-walled structures and critical evaluation of various design procedures. Prerequisite: approval of department. (As arranged)
- \*287 **Automated Design of Complex Structures (3)**  
Review of techniques for automated design, including mathematical programming, fully stressed design, and optimality criteria. Application of automated design techniques to stiffened and composite shell-type structures. Multiple-load conditions and design constraints. Prerequisite: approval of department. (As arranged)
- 288 **Advanced Finite Element Methods in Structural Mechanics (3)**  
Review of variational formulation of the finite element method. Formulation of various continuum and structural elements. Application to static and dynamic problems in elasticity, plasticity, large deflection, and instability in plates and shells. Recent developments in finite element methods. Prerequisite: CE 210, EngS 285. (As arranged)
- 289 **Special Topics in Theoretical and Applied Mechanics (3)**  
Prerequisite: approval of department. (As arranged)
- 298 **Research (arr.)**  
Basic research projects as arranged. May be repeated for credit. (Fall and Spring)
- 299-300 **Thesis Research (3-3)**  
(Fall and Spring)
- \*310 **Aeroacoustics (3)**  
General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary-layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)
- \*311 **Nonlinear Acoustics (3)**  
Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of department. (As arranged)
- \*312 **Theory of Random Vibration (3)**  
Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)
- \*313 **Structural Acoustic Interaction (3)**  
Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)
- 314 **Advanced Numerical Methods (3)**  
Finite difference, finite element, and spectral methods for elliptic, parabolic, and hyperbolic differential-equation systems. Parallel- and array-processing techniques. Nonlinear equations. Prerequisite: ApSc 213, EngS 284. (As arranged)
- 315 **Introduction to Nonlinear Mechanics of Continua (3)**  
Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions. Deformation, kinematics, stress, balance



principles. Principles for constitutive relations. Applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212.  
(Spring, even years)

**398 Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

**399 Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)



## Electrical Engineering and Computer Science

**Professors** R. B. Heller, W. K. Kahn, R. L. Pickholtz, M. F. Eisenberg, A. C. Meltzer, W. D. Maurer, A. D. Friedman, H. J. Helgert, R. H. Lang, J. D. Foley (Chair), T. N. Lee, E. Della Torre, R. J. Harrington, L. J. Hoffman, O. N. Garcia, W. Wasylkiwskyj, N. A. Alexandridis, S. Y. Berkovich, M. B. Feldman, S. J. Raff (Research), M. H. Loew, G. V. Borgiotti, F. Vajda (Distinguished Visiting), R. L. Carroll, Jr., M. E. Zaghloul

**Adjunct Professors** J. M. Aein, P. J. Crepeau, G. J. Kowalski, D. C. Roberts, A. Schneider

**Professorial Lecturers** H.-L. A. Hung, A. A. Wolf, W. D. Jackson, W. T. Bisignani, S. H. Durrani, R. K. Khatri, C. E. Dunham, L. M. Leibowitz, P. M. Kelly, M. Mohajerbi, F. Dellon, J. R. Silverman, J. A. Knight, F. P. Pantuso, J. H. Scharen-Guivel, J. Foreman, M. H. Friedman, T. T. Nieh, C. Alexander, Jr., G. M. Borsuk, J. Donelson III, J. W. Benoit, R. A. Herring, Jr., A. F. Manfredi, Jr., A. K. Mehrotra, C.-H. C. Wang, W. W. Wu, R. M. Finn, D. L. Nicholson, W. L. Pritchard, J. M. Schumpert

**Associate Professors** N. Kyriakopoulos, D. C. Rohlfs (Director of Laboratories), J. L. Sibert, P. S. Bock, D. B. Newman, Jr., N. S. Chauhan (Visiting), L. Kitov (Research)

**Adjunct Associate Professor** B. Jabbari

**Associate Professorial Lecturers** A. S. Gill, H. Carus, M. C. Chen, R. D. Angelari, J. C.-C. Hsing, G. R. Lawrence, J. W. Fussell, P. A. Lamb, C. V. Stewart, R. R. Landberg, M. S. Gluck, S. H. Kaisler, D. R. Smith, A. L. Breitler, P. K. Wahi, H. I. Bassen, C. A. Eldridge, J. A. Lipkin, Y.-S. Fu, C. M. Waespy, J. Epstein, L. A. Fletcher, J. S. Davies, Jr., A. T. Le, E. B. Leiderman, E. H. Neal, J. J. Seppy, L. L. Burge, J. E. Pfaendtner



**Assistant Professors** S. Rotenstreich, D. Saha, R. S. Heller, A. K. Kakaes, C. D. Martin, B. Narahari, H. Senay, A. Youssef, J. M. Schnizlein (*Visiting*), Y. Chen (*Visiting*), H.-A. Choi

**Assistant Professorial Lecturers** F. M. Brosi, Jr., T. R. Husson, K. J. Schmucker, C. E. McCullough, J. B. Bronder, C. E. Knadler, Jr., S. J. Koch, J. D. Kotulski, R. M. Tarakan, E. A. Walker, D. A. J. Eide, T. Nelson, R. M. Holland, P. P. Senyo, L. S. Finlayson, V. A. Marshall III, J. W. Sargent, M. F. D'Antonio, F. T. Khalatbari, M. C. McElvaney, Y. K. Park, E. S. Armstrong, J. F. Kuehls, D. D. Moerder

**Lecturer** E. Abramic

The undergraduate programs of study in the Department of Electrical Engineering and Computer Science lead to the degrees of Bachelor of Science (Electrical Engineering), Bachelor of Science (Computer Engineering), and Bachelor of Science (Computer Science). In the electrical engineering program, an option is available in premedical engineering.

## Electrical Engineering Undergraduate Study

Electrical engineering is concerned with the generation, transmission, control, and utilization of electricity as a source of energy and a medium of communication. Electrical engineers design generators that produce electrical energy, transmission networks that carry this power to homes and factories, and motors that use it to drive machinery. They harness electromagnetic radiation to produce radio waves for the propagation of radio and television signals and the transmission of information via satellites, and design the electronic circuits used in communications equipment and computers. Electrical engineers are now developing instrumentation to assist the medical profession in understanding the causes of disease and to aid in enhancing the quality of and prolonging life.

Because the world's primary energy sources are limited, electrical power is an important resource. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers, and they are involved in research to produce electrical energy directly from solar power.

Electrical engineering is a discipline in which practical, theoretical, and scientific aspects are integrated. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and allow students to develop a sound foundation of basic and engineering sciences. At the beginning of the third year, students decide whether they will follow the regular electrical engineering curriculum or concentrate in premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computers. The student has an opportunity during the last year to work on individual projects in areas such as communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate full-time, part-time, and cooperative education students. Undergraduate courses are offered once a year during the day for full-time students and once every two years in the evening for part-time students.



## Subject Areas

### Communications

- EE 143: Elements of Communications Engineering Design I
- EE 144: Elements of Communications Engineering Design II
- EE 146: Communications Design Laboratory

### Controls, Systems, and Power

- EE 166: Electrical Power Laboratory I
- EE 172: Control Systems Design
- EE 176: Control Systems Laboratory
- EE 177: Electrical Energy Conversion
- EE 178: Electrical Power Systems

### Electronics

- EE 20: Introductory Engineering Electronics
- EE 121: Engineering Electronics and Design
- EE 122: Digital Electronics and Design
- EE 124: Nonlinear Electronic Devices
- EE 126: Introduction to VLSI Design and Simulation
- EE 127: VLSI Fabrication Techniques
- EE 128: Testing and Simulation of VLSI Circuits
- EE 169: Advanced Electronics Design Laboratory

### Fields and Waves

- EE 31: Fields and Waves I
- EE 32: Fields and Waves II
- EE 133: Electromagnetic Waves and Microwave Systems Design
- EE 168: Microwave and Laser Engineering Laboratory

### Laboratories and Measurement

- CSci 163: Senior Computer Science Project Laboratory I
- CSci 164: Senior Computer Science Project Laboratory II
- EE 63: Instrumentation and Networks Laboratory
- EE 65: Solid-State Devices Laboratory
- EE 66: Digital Electronics Design Laboratory
- EE 67: Switching Circuits Laboratory
- EE 163: Senior Electrical Engineering Project Laboratory I
- EE 164: Senior Electrical Engineering Project Laboratory II

### Medical Engineering

- EE 184: Introduction to Medical Engineering
- EE 186: Medical Engineering Laboratory

### Networks

- EE 11: Linear Networks I
- EE 12: Linear Networks II
- EE 113: Network Analysis and Design
- EE 116: Introduction to Network Synthesis



### Core Curriculum

Normally the first four semesters are common to all electrical engineering undergraduate degree programs and to undergraduate fields in other departments of the School of Engineering and Applied Science.

#### First Semester

- BiSc 11: Introductory Biology for Science Majors (4) (pre-med option only)
- CSci 51: Introduction to Computing (3)
- Engl 9 or 10: English Composition: Language as Communication (3)
- Math 31: Single-Variable Calculus I (3)
- Phys 13: General Physics for Engineering and Applied Science (3)
- Elective: Selected from humanities or social sciences (3) (except pre-med option)

#### Second Semester

- BiSc 12: Introductory Biology for Science Majors (4) (pre-med option only)
- Chem 13: General Chemistry (4)
- CSci 53: Computers and Society (2)
- CSci 56: FORTRAN Programming (1)
- Math 32: Single-Variable Calculus II (3)
- Phys 14: Mechanics and Thermal Physics (3)
- Elective: Selected from humanities or social sciences (3) (except pre-med option)

#### Third Semester

- ApSc 57: Analytical Mechanics I (2)
- ApSc 113: Engineering Analysis I (3)
- ApSc 115: Engineering Analysis III (3)
- Math 33: Multivariable Calculus (3)
- Phys 15: Electricity and Magnetism (3)
- Elective: Selected from humanities or social sciences (3)

#### Fourth Semester

- ApSc 58: Analytical Mechanics II (3)
- ApSc 114: Engineering Analysis II (3)
- CE 140: Materials Science (3)
- Chem 22,23: Introductory Quantitative Analysis (3) and Laboratory (2) (pre-med option only)
- EE 11: Linear Networks I (3)
- Phys 16: Modern Physics (3)
- Elective: Selected from humanities or social sciences (3) (except pre-med option)

### Electrical Engineering Curriculum

#### Fifth Semester

- CSci 147: Assembly Language Programming I (3)
- EE 12: Linear Networks II (3)
- EE 20: Introductory Engineering Electronics (3)
- EE 31: Fields and Waves I (3)
- EE 63: Instrumentation and Networks Laboratory (1)
- EE 65: Solid-State Devices Laboratory (1)
- Elective: Selected from humanities or social sciences (3)



**Sixth Semester**

- CSci 153: Design of Switching Systems (3)
- EE 32: Fields and Waves II (3)
- EE 66: Digital Electronics Design Laboratory (1)
- EE 67: Switching Circuits Laboratory (1)
- EE 121: Engineering Electronics and Design (3)
- EE 122: Digital Electronics and Design (3)
- EE 177: Electrical Energy Conversion (3)

**Seventh Semester**

- EE 143: Elements of Communications Engineering Design I (3)
- EE 163: Senior Electrical Engineering Project Laboratory I (2)
- EE 172: Control Systems Design (3)
- Elective: Technical electives (9)—three courses selected from the list below
- Elective: One laboratory (1 credit) selected from EE 146, 166, 169

**Eighth Semester**

- EE 144: Elements of Communications Engineering Design II (3)
- EE 164: Senior Electrical Engineering Project Laboratory II (2)
- Elective: Technical electives (5)—two courses selected from the list below
- Elective: One laboratory (1 credit) selected from EE 166, 168, 176, 186
- Elective: Selected from humanities or social sciences (3)

**Technical Electives**

- ApSc 199: Honors Research Project and Seminar (3)
- CSci 150: Introduction to Microcomputers (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- EE 113: Network Analysis and Design (3)
- EE 116: Introduction to Network Synthesis (3)
- EE 124: Nonlinear Electronic Devices (3)
- EE 126: Introduction to VLSI Design and Simulation
- EE 127: VLSI Fabrication Techniques
- EE 128: Testing and Simulation of VLSI Circuits
- EE 133: Electromagnetic Waves and Microwave Systems Design (3)
- EE 146: Communications Design Laboratory (1)
- EE 160: Electrical Measurements and Instrumentation (3)
- EE 166: Electrical Power Laboratory I (1)
- EE 168: Microwave and Laser Engineering Laboratory (1)
- EE 169: Advanced Electronics Design Laboratory (1)
- EE 176: Control Systems Laboratory (1)
- EE 178: Electrical Power Systems (3)
- EE 184: Introduction to Medical Engineering (3)
- EE 186: Medical Engineering Laboratory (1)
- EE 192: Robotic Systems Design and Applications (3)
- EE 196: Robotics and Automation Laboratory (1)
- ME 131: Thermodynamics (3)
- ME 187: Heat Transfer (3)
- ME 194: Energy Conversion (3)

Note: Students may also elect appropriate graduate courses with the permission of their advisers.



### Premedical Engineering Option

The premedical engineering option permits the student to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for study toward the Doctor of Medicine degree. The student will also have sufficient background to work in various health sciences fields and in the research and development of new electronic equipment used in medicine or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

The program of study for the first four semesters is the same as that outlined in the electrical engineering core curriculum, above.

#### Fifth Semester

- Chem 151: Organic Chemistry (3)
- Chem 153: Organic Chemistry Laboratory (1)
- CSci 147: Assembly Language Programming I (3)
- EE 12: Linear Networks II (3)
- EE 20: Introductory Engineering Electronics (3)
- EE 31: Fields and Waves I (3)
- EE 63: Instrumentation and Networks Laboratory (1)
- EE 65: Solid-State Devices Laboratory (1)

#### Sixth Semester

- Chem 152: Organic Chemistry (3)
- Chem 154: Organic Chemistry Laboratory (1)
- EE 32: Fields and Waves II (3)
- EE 66: Digital Electronics Design Laboratory (1)
- EE 67: Switching Circuits Laboratory (1)
- EE 121: Engineering Electronics and Design (3)
- EE 122: Digital Electronics and Design (3)
- Elective: Selected from humanities or social sciences (3)

#### Seventh Semester

- EE 143: Elements of Communications Engineering Design I (3)
- EE 163: Senior Electrical Engineering Project Laboratory I (2)
- EE 169: Advanced Electronics Design Laboratory (1)
- EE 172: Control Systems Design (3)
- Elective: Technical elective (3)
- Elective: Selected from humanities or social sciences (6)

#### Eighth Semester

- CSci 153: Design of Switching Systems (3)
- EE 164: Senior Electrical Engineering Project Laboratory II (2)
- EE 184: Medical Engineering and Systems Design (3)
- EE 186: Medical Engineering Laboratory (1)
- Elective: Technical elective (3)
- Elective: Selected from humanities or social sciences (6)

#### Technical Electives

- ApSc 199: Honors Research Project and Seminar (3)
- Bioc 221-22: General Biochemistry (4-4)
- BiSc 145: Principles of Development (4)
- BiSc 148: Histology (4)



- EE 144: Elements of Communications Engineering Design II (3)  
 EE 192: Robotic Systems Design and Applications (3)

## Electrical Engineering Undergraduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

- 3 Electronics for Nonengineers I (3)**  
 Introduction to the basic theory and practical applications of modern electronics, with emphasis on material of value to the nontechnical individual in an increasingly technological society. Topics include basic electrical theory, solid-state devices, amplifiers and other electronic circuits, instrumentation, communications, and microcomputer circuits. May not be taken for credit by students in SEAS. (Fall) (Eisenberg)
- 11 Linear Networks I (3)**  
 Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution. First- and second-order networks, phasors, and steady-state analysis. Use of circuit-simulation programs. Prerequisite: ApSc 113; Phys 15. (Fall and Spring) (Zaghloul)
- 12 Linear Networks II (3)**  
 Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Use of circuit-simulation programs. Prerequisite: ApSc 114, EE 11. (Fall and Spring) (Zaghloul)
- 20 Introductory Engineering Electronics (3)**  
 Various types of solid-state devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of SPICE, MICRO-CAP II, and graphical techniques. Prerequisite: EE 11. (Fall and Spring) (Heller)
- 31 Fields and Waves I (3)**  
 Vector calculus, orthogonal coordinates, Coulomb and Gauss laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady currents, Laplace and Poisson equations, boundary-value problems. Prerequisite: ApSc 113; Phys 15, 16. (Fall) (Kahn)
- 32 Fields and Waves II (3)**  
 Biot-Savart law, Ampere law, vector potential, magnets, Faraday law, Maxwell equations, plane waves, and Poynting vector. Prerequisite: ApSc 114, EE 31. (Spring) (Kahn)
- 63 Instrumentation and Networks Laboratory (1)**  
 Use of standard laboratory electronic instruments in the measurement of electrical and electronic components and networks. Verification of network laws and theorems. Characteristics and limitations of instruments. Application of instruments to measure voltage, current, resistance, impedance, power, time, period, and frequency. Use of digital multimeter, frequency counter, function generator, and oscilloscope to measure steady-state and transient phenomena. Prerequisite or concurrent registration: EE 12, 20. (Fall and Spring) (Rohlf)
- 65 Solid-State Devices Laboratory (1)**  
 Testing and measurement of the characteristics of solid-state devices used in electronic systems: diodes, BJTs, FETs, SCRs, timers, op amps, and ICs; applications. Design and measurement of the characteristics of power supplies, BJT and FET amplifier circuits, clipping and clamping circuits, power control



- circuits, and timing circuits. Prerequisite or concurrent registration: EE 63. (Fall and Spring) (Rohlf's)
- 66 **Digital Electronics Design Laboratory (1)**  
Characteristics of electronic devices used in switching, sweeping, and wave-forming circuits. Generation of waveforms. Digital storage devices and sequen-tial circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65; prerequisite or con-current registration: EE 122. (Fall and Spring) (Rohlf's)
- 67 **Switching Circuits Laboratory (1)**  
Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, charac-ter generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, CSci 153. (Fall and Spring) (Rohlf's)
- 111 **Circuits and Electronics (3)**  
Introduction to electrical circuit theory and analog electronic circuits for stu-dents in computer science. Topics include electrical-quantities circuit princi-ples, network theorems, waveforms, impedance concepts, circuit response, network analysis, two-part networks, diode circuits, transistor circuits, opera-tional amplifiers, biasing circuits, small-signal amplifiers, multistage ampli-fiers. Prerequisite: ApSc 113, Phys 15. (Fall and Spring) (Meltzer)
- 112 **Digital Electronics (3)**  
Continuation of the study of electronic circuits for students in computer science. Topics include diode characteristics, diode switches, diode logic gates, transistor switching characteristics, transistor switches, transistor gates, mode-transistor gates, transistor-transistor gates, transistor-transistor logic, emitter-coupled logic, MOS gates, flip-flop circuits, clocked flip-flops, counters and registers, memory system, PROMS, DRAMS, EAPROMS, RAM, analog-to-digital conversion. Prerequisite: EE 111. (Fall and Spring) (Meltzer)
- 113 **Network Analysis and Design (3)**  
Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer func-tions; properties of active networks, including reciprocity, stability, activity, and feedback. Use of network analysis programs such as SPICE. Prerequisite: EE 12, 20. (Fall) (Kyriakopoulos)
- 116 **Introduction to Network Synthesis (3)**  
Network functions and their properties. Positive real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port syn-thesis; the approximation problem in the frequency domain; modern fil-ter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring) (Lee)
- 121 **Engineering Electronics and Design (3)**  
Graphical analysis and design beyond the level covered in EE 20. Design of push-pull, direct-coupled, and class B and C amplifiers. Design of operational amplifiers; use in filters and electronic systems. Design of oscillators, active filters, modulators, and demodulators. Use of SPICE and MICRO-CAP II in design. Prerequisite: EE 12, 20. (Fall) (Heller)
- 122 **Digital Electronics and Design (3)**  
Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flip-flops. Concepts in inte-grated circuit design. Design of counting and timing circuits using ICs. Pulse, sweep, and wave-shaping circuits. Prerequisite: EE 12, 20. (Spring) (Eisenberg)
- 124 **Nonlinear Electronic Devices (3)**  
Theory and operation of electronic devices designed from nonlinear or quantum mechanical principles. Surface acoustic wave (SAW) devices and their use in special-purpse filters and amplifiers. Varactors and their use as up converters, down converters, and parametric amplifiers. MOS capacitors and CCD devices;



electron-beam-field interacting devices; Klystrons. TWTs and gyrotrons. MABERS, LASERS, and FELs; negative conductance microwave devices; transferred electron mechanism in GaAs; Gunn oscillators. Prerequisite: EE 32, 121. (Spring) (Heller)

**126 Introduction to VLSI Design and Simulation (3)**

Introduction to the theory and use of a CAD/CAM system for the design of VLSI circuits. Topics include stick diagramming, NMOS transistors, switch and gate logic, PLAs, finite-state machines, master-slice techniques, design rules for the CAD system, speed and power considerations, floor planning, layout techniques. The student will design a VLSI circuit using the CAD computer and simulate the design. May be taken for graduate credit. Prerequisite: CSci 147, 153; EE 122 or equivalent. (Fall) (Zaghloul)

**127 VLSI Fabrication Techniques (3)**

Choice of circuit technologies, process technologies associated with various types of components, different chip architectures, master-slice techniques, gate arrays, standard cell, PLA. Fabrication of VLSI, two basic MOS technologies and other available technologies, oxidation, photoengraving, chemical etching, diffusion. May be taken for graduate credit. Prerequisite: CSci 147, 153; EE 122. (Spring) (Zaghloul)

**128 Testing and Simulation of VLSI Circuits**

Continuation of EE 126, principally for the testing of VLSI circuits that have been designed and fabricated. Topics include testing techniques and use of the VLSI system-testing laboratory. Design for testability techniques and design of a testable system. Simulation techniques used in the design of VLSI circuits. Static tests, dynamic testing, functional testing. Students must test the circuits previously designed. May be taken for graduate credit. Prerequisite: EE 126. (Spring) (Zaghloul)

**131 Computer Science Hardware Laboratory I (1)**

For students in computer science. Use of electronic instruments for the measurement of electronic components. Characteristics of laboratory instruments. Applications for the measurement of voltage, current, resistance, impedance, period, and frequency. Measurements of electronic devices, such as transistors and amplifiers. Prerequisite: EE 111. (Fall) (Meltzer)

**132 Computer Science Hardware Laboratory II (1)**

For students in computer science. Analysis and design of combinational and sequential circuits using integrated circuits. Analysis of two-level logic, decoders, adders. Design of counters, shift registers, arithmetic units, and memory systems. Prerequisite: EE 112, CSci 153. (Spring) (Meltzer)

**133 Electromagnetic Waves and Microwave Systems Design (3)**

Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities. Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Fall) (Kahn)

**143 Elements of Communications Engineering Design I (3)**

Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite, and optical links. Prerequisite or concurrent registration: EE 121. (Fall) (Newman)

**144 Elements of Communications Engineering Design II (3)**

Statistical theory of communications. Comparison of communications systems in noisy channels. Data communications, design of modems. Concept of information theory. Coding for noisy channels. ARQ and forward error control. Communications protocols. Elements of traffic theory. Special topics and student project. Prerequisite: EE 143 or permission of course director. May be taken for graduate credit by students in fields other than communications. (Spring) (Newman)

**146 Communications Design Laboratory (1)**

Experiments in support of the analysis and design of communications systems. Characteristics of real-time communication signals. Spectrum analyzer veri-



- fication of waveforms. Analysis and design of encoding and decoding amplitude-modulation (AM) and frequency-modulation (FM) circuits, frequency conversion, frequency and time-division multiplexing, and digital communication circuits—continuously variable slope delta modulation (Delta) and pulse-code modulation (PCM). Prerequisite or concurrent registration: EE 32, 67, 143. (Fall) (Rohlf)
- 160 **Electrical Measurements and Instrumentation (3)**  
Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 32, 121; CSci 150. (Spring) (Heller)
- 163 **Senior Electrical Engineering Project Laboratory I (2)**  
Conception and design of a one-year project to be completed in EE 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 67 and senior status; prerequisite or concurrent registration: EE 122, 143. (Fall) (Meltzer)
- 164 **Senior Electrical Engineering Project Laboratory II (2)**  
Completion and construction of the project started in EE 163. Oral and written presentation of the product designed. Prerequisite: EE 163. (Spring) (Meltzer)
- 166 **Electrical Power Laboratory I (1)**  
Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of devices to generate electricity. Rectification and inversion processes for power systems and drives. Prerequisite or concurrent registration: EE 67, 177. (Fall and Spring) (Harrington)
- 168 **Microwave and Laser Engineering Laboratory (1)**  
Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite: EE 67, 133, 143. (Spring) (Wasyliwskyj)
- 169 **Advanced Electronics Design Laboratory (1)**  
Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use of electronic devices in communication equipment. May be taken for graduate credit by graduate students who are not majoring in energy conversion, power, and transmission. Prerequisite: EE 32, 67; prerequisite or concurrent registration: EE 121, 122. (Fall) (Heller)
- 172 **Control Systems Design (3)**  
Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114, EE 12 or ME 134. (Spring) (Kyriakopoulos)
- 176 **Control Systems Laboratory (1)**  
Experiments in support of control theory, involving the use of the digital computer for process control in real time. Design of feedback and compensation with computer implementation. Digital simulation of linear and nonlinear systems. Prerequisite or concurrent registration: EE 67, 172 or equivalent. (Spring) (Carroll)
- 177 **Electrical Energy Conversion (3)**  
Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase AC rotating machines, DC machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Fall and Spring) (Harrington)
- 178 **Electrical Power Systems (3)**  
Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis.



Voltage, current, and power restrictions and limitations. Analysis of lightning and switching surges in power systems. Protective devices—switchgear, arresters, and isolators. May be taken for graduate credit. Prerequisite: EE 177 and senior status. (Fall) (Harrington)

184 **Introduction to Medical Engineering (3)**

(Formerly *Medical Engineering Instrumentation and Systems Design*)

Terminology of the medical profession; physiology of the human body, from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering may be applied advantageously to medicine. May be taken for graduate credit by students in fields other than medical engineering. (Spring) (Eisenberg)

186 **Medical Engineering Laboratory (1)**

Experiments in support of instrumentation used in medicine and biology; safety considerations. Acquisition and measurement of physiological signals, EKG, EEG, evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 32, 66, 121, 184. (Spring) (Loew)

192 **Robotic Systems Design and Applications (3)**

Modeling and analysis of robot designs. Kinematics, statics, and dynamics of mechanical linkages. Design and analysis of mechanical structures, actuators, transmissions, and sensors. Design of robot control systems, including techniques of adaptive control and artificial intelligence. Principles of vision systems and image analysis. Relevant computer hardware and software. Current industrial applications and limitations of robotic systems. Prerequisite: ApSc 58, EE 172 or ME 182, and knowledge of high-level programming. (Fall and Spring) (Bock)

196 **Robotics and Automation Laboratory (1)**

Experiments illustrating basic principles and programming of robots and other automated machinery, with emphasis on accuracy, repeatability, capacity, and inverse kinematics. Students design and write computer programs that interface with a robot's arm, vision system, and data files to cause the robot to pick and place, to manipulate, and to trace a curve. Prerequisite or concurrent registration: EE 192/ME 197. (Spring) (Carroll)

197 **Special Topics in Electrical Engineering (1 to 3)**

Topic to be announced in the *Schedule of Classes*. (Fall and Spring)

198 **Research (1 to 3)**

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Computer Engineering Undergraduate Study

Computer engineering is a developing discipline that combines electronic design, programming of computers, and mathematics into a comprehensive area. The student learns the design and use of computers for scientific and business applications. Students who complete this program will be able to design both hardware and software for minicomputers and large-scale computing systems. The student will also be able to use computer hardware and software for control of large systems. The curriculum prepares the student to begin a career in computer design, applications, and use or to pursue graduate study.

### Courses in the Subject Area

CSci 51: Introduction to Computing

CSci 53: Computers and Society

CSci 56: FORTRAN Programming

CSci 147: Assembly Language Programming I



CSci 150: Introduction to Microcomputers  
CSci 151: Systems Software and Software Engineering  
CSci 153: Design of Switching Systems  
CSci 154: Digital Computer Design  
CSci 155: Introduction to Numerical Methods for Computers  
CSci 156: Introduction to Operating Systems  
CSci 157: Assembly Language Programming II  
CSci 159: Programming and Data Structures  
CSci 160: Concepts of Programming Languages  
CSci 161: Discrete Structures for Computing  
CSci 163: Senior Computer Science Project Laboratory I  
CSci 164: Senior Computer Science Project Laboratory II  
CSci 166: Computer Science Laboratory I  
CSci 167: Computer Science Laboratory II

### Core Curriculum

#### First Semester

CSci 51: Introduction to Computing (3)  
Engl 9 or 10: English Composition: Language as Communication (3)  
Math 31: Single-Variable Calculus I (3)  
Phys 13: General Physics for Engineering and Applied Science (3)  
Elective: Selected from humanities or social sciences (3)

#### Second Semester

Chem 13: General Chemistry (4)  
CSci 53: Computers and Society (2)  
CSci 56: FORTRAN Programming (1)  
Math 32: Single-Variable Calculus II (3)  
Phys 13: Mechanics and Thermal Physics (3)  
Elective: Selected from humanities or social sciences (3)

#### Third Semester

ApSc 57: Analytical Mechanics I (2)  
ApSc 113: Engineering Analysis I (3)  
ApSc 115: Engineering Analysis III (3)  
Math 33: Multivariable Calculus (3)  
Phys 15: Electricity and Magnetism (3)  
Elective: Selected from humanities or social sciences (3)

#### Fourth Semester

ApSc 58: Analytical Mechanics II (3)  
ApSc 114: Engineering Analysis II (3)  
CSci 161: Discrete Structures for Computing (3)  
EE 11: Linear Networks I (3)  
Phys 16: Modern Physics (3)  
Elective: Selected from humanities or social sciences (3)

### Computer Engineering Curriculum

#### Fifth Semester

CSci 147: Assembly Language Programming I (3)  
CSci 159: Programming and Data Structures (3)



- EE 12: Linear Networks II (3)
- EE 20: Introductory Engineering Electronics (3)
- EE 31: Fields and Waves I (3)
- EE 63: Instrumentation and Networks Laboratory (1)
- EE 65: Solid-State Devices Laboratory (1)

#### Sixth Semester

- CSci 153: Design of Switching Systems (3)
- CSci 160: Concepts of Programming Languages (3)
- EE 32: Fields and Waves II (3)
- EE 66: Digital Electronics Design Laboratory (1)
- EE 67: Switching Circuits Laboratory (1)
- EE 122: Digital Electronics and Design (3)
- EE 172: Control Systems Design (3)

#### Seventh Semester

- CSci 150: Introduction to Microcomputers (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- CSci 156: Introduction to Operating Systems (3)
- CSci 163: Senior Computer Science Project Laboratory I (2)
- CSci 166: Computer Science Laboratory I (1)
- Elective: Technical elective (3)
- Elective: Selected from humanities or social sciences (3)

#### Eighth Semester

- CSci 151: System Software and Software Engineering (3)
- CSci 154: Digital Computer Design (3)
- CSci 164: Senior Computer Science Project Laboratory II (2)
- CSci 167: Computer Science Laboratory II (1) or EE 176: Control Systems Laboratory (1)
- Elective: Technical elective (3)
- Elective: Selected from humanities or social sciences (3)

#### Technical Electives

- ApSc 199: Honors Research Project and Seminar (3)
- EE 113: Network Analysis and Design (3)
- EE 121: Engineering Electronics and Design (3)
- EE 124: Nonlinear Electronic Devices (3)
- EE 126: Introduction to VLSI Design and Simulation (3)
- EE 127: VLSI Fabrication Techniques (3)
- EE 128: Testing and Simulation of VLSI Circuits (3)
- EE 133: Electromagnetic Waves and Microwave Systems Design (3)
- EE 143: Elements of Communications Engineering Design I (3)
- EE 144: Elements of Communications Engineering Design II (3)
- EE 177: Electrical Energy Conversion (3)
- EE 184: Introduction to Medical Engineering (3)
- EE 192: Robotic Systems Design and Applications (3)

### Computer Science Undergraduate Study

The Department of Electrical Engineering and Computer Science offers a program of study leading to the degree of Bachelor of Science (Computer Science). Computer science is the study of the computer's physical attributes, or hardware, and the methods of its use, or software. The undergraduate curricu-



lum combines systems design, computer programming, and mathematics to give the student a broad background in the fundamentals of computer science. Students who complete the program will be able to design the hardware and software needed for both large computing systems and small microprocessor-based systems. The curriculum prepares students for graduate school, for careers in computer or software design, and for work with the applications of computers.

Widespread use of the digital computer has caused great changes in virtually every area of human endeavor involving data generation, collection, analysis, reduction, and display. Business, economic, legal, educational, scientific, military, political, and humanitarian organizations have all benefited in some way by using computers. Careers are available in every area related to computer science, including designing, testing, operating, installing, programming, maintaining, instructing, and buying and selling computers and related equipment. Faculty members in the department have research interests that include time-sharing systems, information systems, associative memories and processors, simulation, artificial intelligence, robotics, programming languages, automata theory, interactive computer graphics, human factors of the human-machine interface, microprocessors, distributed processing and networking, fault-tolerant design, security and privacy, correctness of programs, analysis of algorithms, database systems, cartography, and spectral analysis.

The first four semesters of the computer science curriculum include core courses in science, mathematics, and computer science as well as study in English, the humanities, and the social sciences. During the last four semesters, the student must choose an application elective track, which provides the opportunity to concentrate in an area to which computers may be applied. The following application elective tracks are offered: computer-aided design, digital electronics and hardware, engineering administration, financial systems, management decision systems, management information systems, mathematics, and operations research. During the sixth, seventh, and eighth semesters, students select free electives, in consultation with their adviser, in a nontechnical area to broaden their general education. Students are encouraged to select these courses from the humanities, social sciences, communication skills, or other disciplines.

Qualified undergraduate students may participate in faculty research through the Honors Research Program. Students admitted to that program are assigned to selected computer science faculty for academic advising and guidance. They are afforded the opportunity to participate in specially designed research projects and in related seminars. In addition, a limited number of undergraduate students may become research assistants, and summer employment as an assistant to a faculty member conducting research may be available.

### Courses in the Subject Area

- CSci 51: Introduction to Computing
- CSci 53: Computers and Society
- CSci 100: Introduction to Programming
- CSci 132: Theoretical Foundations of Computing
- CSci 147: Assembly Language Programming I
- CSci 150: Introduction to Microcomputers
- CSci 151: System Software and Software Engineering
- CSci 153: Design of Switching Systems
- CSci 154: Digital Computer Design



- CSci 155: Introduction to Numerical Methods for Computers
- CSci 156: Introduction to Operating Systems
- CSci 157: Assembly Language Programming II
- CSci 159: Programming and Data Structures
- CSci 160: Concepts of Programming Languages
- CSci 161: Discrete Structures for Computing
- CSci 171: Computational Methods for Simulation
- CSci 173: Theory of Computer Translators
- CSci 174: Symbolic and Logic Processing for Artificial Intelligence
- CSci 177: Programming for Management Systems
- CSci 178: Introduction to Database Management
- CSci 185: Interactive Computer Graphics I
- CSci 188: Distributed Computing Systems
- EE 111: Circuits and Electronics
- EE 112: Digital Electronics

### Laboratories

- CSci 54: Programming Laboratory
- CSci 121: Software Laboratory I
- CSci 122: Software Laboratory II
- CSci 163: Senior Computer Science Project Laboratory I
- CSci 164: Senior Computer Science Project Laboratory II
- CSci 166: Computer Science Laboratory I
- CSci 167: Computer Science Laboratory II
- EE 131: Computer Science Hardware Laboratory I
- EE 132: Computer Science Hardware Laboratory II

### Core Curriculum

#### First Semester

- CSci 51: Introduction to Computing (3)
- Engl 9 or 10: English Composition: Language as Communication (3)
- Math 31: Single-Variable Calculus I (3)
- Phys 13: General Physics for Engineering and Applied Science (3)
- Elective: Selected from humanities or social sciences (3)

#### Second Semester

- CSci 53: Computers and Society (2)
- CSci 54: Programming Laboratory (1)
- CSci 147: Assembly Language Programming I (3)
- Math 32: Single-Variable Calculus II (3)
- Phys 14: Mechanics and Thermal Physics (3)
- Elective: Selected from humanities or social sciences (3)

#### Third Semester

- ApSc 113: Engineering Analysis I (3)
- CSci 159: Programming and Data Structures (3)
- CSci 161: Discrete Structures for Computing (3)
- Math 33: Multivariable Calculus (3)
- Phys 15: Electricity and Magnetism (3)
- Elective: Selected from humanities or social sciences (3)

#### Fourth Semester

- ApSc 115: Engineering Analysis III (3)
- Chem 13: General Chemistry (4)



- CSci 132: Theoretical Foundations of Computing (3)
- CSci 153: Design of Switching Systems (3)
- CSci 160: Concepts of Programming Languages (3)

### Curriculum for Digital Electronics and Hardware Application Elective Track

A student selecting the Digital Electronics and Hardware Application Elective Track must complete the following curriculum, which includes 13 credit hours of application electives. Students admitted to the Honors Research Program may substitute ApSc 199 for one three-credit course, chosen in consultation with their adviser.

#### Fifth Semester

- CSci 121: Software Laboratory I (1)
- CSci 150: Introduction to Microcomputers (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- CSci 173: Theory of Computer Translators (3)
- EE 111: Circuits and Electronics (3) (application elective)
- EE 131: Computer Science Hardware Laboratory I (1) (application elective)
- Engl 110: Writing in Engineering and the Sciences (3)

#### Sixth Semester

- CSci 122: Software Laboratory II (1)
- CSci 154: Digital Computer Design (3)
- CSci 156: Introduction to Operating Systems (3)
- CSci 171: Computational Methods for Simulation (3)
- EE 112: Digital Electronics (3) (application elective)
- EE 132: Computer Science Hardware Laboratory II (1) (application elective)
- Elective: Selected from humanities or social sciences (3)

#### Seventh Semester

- CSci 151: System Software and Software Engineering (3)
- CSci 163: Senior Computer Science Project Laboratory I (2)
- CSci 166: Computer Science Laboratory I (1) (application elective)
- CSci 177: Programming for Management Systems (3)
- or
- CSci 185: Interactive Computer Graphics I (3)
- CSci 188: Distributed Computing Systems (3) (application elective)
- Elective: Selected from humanities or social sciences (3)
- Elective: Free elective (nontechnical) (3)

#### Eighth Semester

- CSci 164: Senior Computer Science Project Laboratory II (2)
- CSci 167: Computer Science Laboratory II (1) (application elective)
- CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)
- CSci 178: Introduction to Database Management (3)
- Elective: Selected from humanities or social sciences (3)
- Elective: Free electives (nontechnical) (6)

### Curriculum for Other Application Elective Tracks

A student who does not wish to follow the Digital Electronics and Hardware Application Elective Track Curriculum must choose one of the other application



elective tracks listed below and complete the following curriculum. Students admitted to the Honors Research Program may substitute ApSc 199 for one three-credit course, chosen in consultation with their adviser.

#### Fifth Semester

- CSci 121: Software Laboratory I (1)
- CSci 150: Introduction to Microcomputers (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- CSci 173: Theory of Computer Translators (3)
- Engl 110: Writing in Engineering and the Sciences (3)
- Elective: Application elective selected from chosen track (3)

#### Sixth Semester

- CSci 122: Software Laboratory II (1)
- CSci 154: Digital Computer Design (3)
- CSci 156: Introduction to Operating Systems (3)
- CSci 171: Computational Methods for Simulation (3)
- Elective: Application elective selected from chosen track (3)
- Elective: Selected from humanities or social sciences (3)
- Elective: Free elective (nontechnical) (3)

#### Seventh Semester

- CSci 151: System Software and Software Engineering (3)
- CSci 163: Senior Computer Science Project Laboratory I (2)
- CSci 177: Programming for Management Systems (3)
- or
- CSci 185: Interactive Computer Graphics I (3)
- Elective: Application elective selected from chosen track (3)
- Elective: Selected from humanities or social sciences (3)
- Elective: Free elective (nontechnical) (3)

#### Eighth Semester

- CSci 164: Senior Computer Science Project Laboratory II (2)
- CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)
- CSci 178: Introduction to Database Management (3)
- Elective: Application elective selected from chosen track (3)
- Elective: Selected from humanities or social sciences (3)
- Elective: Free elective (nontechnical) (3)

#### Other Application Elective Tracks

Student must choose an application elective track from those listed below and complete 12 credit hours in the track selected.

#### Computer-Aided Design

- EngS 282: Computer-Aided Design (3)
- EngS 283: Application of Computer Graphics in Engineering (3)
- EngS 284: Numerical Methods in Engineering (3)
- EngS 285: Finite Element Methods in Engineering Mechanics (3)

#### Engineering Administration

- EAd 150: Introduction to Engineering Administration (3)



- EAd 160: Introduction to Engineering Economic Analysis (3)
- EAd 170: Basic Quantitative Methods of Engineering Administration (3)
- EAd 211: Engineering Administration (3)

### Financial Systems

- Accy 51: Introductory Financial Accounting (3)
- Accy 52: Introductory Managerial Accounting (3)
- BAd 120: Business Finance (3)
- BAd 123: Investment and Portfolio Management (3)

### Management Decision Systems

- BAd 140: Basic Marketing Management (3)
- BAd 183: Logistics Management (3)
- BAd 188: Managing Production/Operations (3)
- BAd 191: Fundamentals of Management (3)

### Management Information Systems

- Mgt 107: Fundamentals of Behavioral Science (3)
- Mgt 120: Structured Development with CASE (3)
- Mgt 121: Expert Database Systems (3)
- Mgt 122: Applied Artificial Intelligence (3)

### Mathematics

- ApSc 114: Engineering Analysis II (3)
- Math 101: Introduction to Mathematical Logic (3)
- Math 113: Introduction to Combinatorics (3)
- Math 121-22: Introduction to Abstract Algebra (3-3)
- Math 123: Linear Algebra (3)

### Operations Research

- OR 101: Survey of Operations Research: Deterministic Models (3)
- OR 102: Survey of Operations Research: Stochastic Models (3)
- OR 151: Linear Programming (3)
- OR 190: Applied Systems Analysis and Engineering (3)

## Computer Science Undergraduate Courses

The faculty member whose name appears at the end of each course description is the course director. He or she is not necessarily the instructor for any given semester.

### 10 Word Processing, Database Management, and Spreadsheet Applications (3)

Introduction to the use of microcomputer hardware and software for word processing (e.g., WordPerfect), spreadsheets (e.g., Quattro), and database management (e.g., dBase III), with emphasis on the use of microcomputers to solve typical problems in academia and business. May not be counted toward degree requirements by majors in the department. (Fall and Spring) (Heller)

### 11 Microcomputer DBMS, Charting, and Ledger Systems (3)

Microcomputer database management systems such as dBASE III. Charting systems such as VISIPLLOT. Ledger systems such as Peachtree General Ledger. Hands-on experience in using these systems on microcomputers. May not be counted toward degree requirements by majors in the department. Prerequisite: CSci 10. (Fall and Spring) (Maurer)



**30 Computer Literacy (3)**

For students whose majors are not electrical engineering or computer science. Survey of computers and languages, communicating with a computer, introduction to BASIC, obtaining output from a computer, history of computing, positions in the computing industry, the effect of computers on our lives, uses for computers. May not be counted toward degree requirements by majors in the department. Prerequisite: high school algebra. (Fall and Spring) (Martin)

**51 Introduction to Computing (3)**

Introduction to the solution of problems on a digital computer, using the Pascal language. Structured programming concepts, including top-down algorithm design and step-wise refinement of problem solution; peer review and proper documentation techniques; efficiency of programs; design of test data. Numerical and nonnumerical problems, including theory and solution of matrix problems. Writing, debugging, and running programs in an interactive computing environment. Graduate students seeking a first course in computing should enroll in CSci 100. Prerequisite or concurrent registration: Math 31 or permission of instructor. (Fall and Spring) (Martin)

**53 Computers and Society (2)**

History and impact of computers. Use of computers in the professions. Professional ethics for programmers and engineers. Applications of computers in the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Nature, use, and effects of a computer simulation. Application of software engineering concepts to problem solving. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

**54 Programming Laboratory (1)**

Advanced programming techniques, including efficiency and complexity of programs, dynamic data structures, and recursion. Design and implementation of a large programming project, using the programmer team model. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

**56 FORTRAN Programming (1)**

Introduction to the FORTRAN language, using concepts of program structure, modularity, and data structures. Advanced programming techniques, including efficiency and complexity of programs and use of COMMON. Design and implementation of a large programming project, using the programmer team model. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

**100 Introduction to Programming (3)**

More intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN. Data-processing concepts, numerical and nonnumerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Fall and Spring) (Martin)

**121 Software Laboratory I (1)**

Computer-programming projects designed to supplement the theory and programs of CSci 160 and 173. Students write structured programs and use proper documentation. Prerequisite or concurrent registration: CSci 173. (Fall) (Rotenstreich)

**122 Software Laboratory II (1)**

Computer-programming projects designed to supplement the theory and programs of CSci 156. Team projects to design new I/O drives and similar projects involving operating system modules. Structured programming and proper documentation techniques. Prerequisite or concurrent registration: CSci 156. (Spring) (Rotenstreich)

**132 Theoretical Foundations of Computing (3)**

Ordering, formal grammars, finite-state machines, equivalence of machines, reduction, finite-state languages, acceptors, regular expressions, pushdown



- automata, context-free languages, Turing machines, computability. Prerequisite: CSci 161; concurrent registration: CSci 160. (Spring) (Choi)
- 147 **Assembly Language Programming I (3)**  
Programming of microcomputers in machine and assembly language. Number systems and codes. Architectures of various microcomputers. Methods of addressing and machine control. Data representation in a microcomputer input-output control. Timing and bench-marking techniques. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 51 or equivalent. (Fall and Spring) (Rotenstreich)
- 150 **Introduction to Microcomputers (3)**  
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information, and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer architectures. Prerequisite: CSci 147, 153, or permission of course director. (Fall and Spring) (Alexandridis)
- 151 **System Software and Software Engineering (3)**  
Concepts and use of macroassemblers, loading and relocation of modules, library management, linkers and loaders. Control of I/O via access methods. Concepts in software engineering such as requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance. Program design using program design languages, HIPO charts. Software tools. Software project organization, design teams, quality assurance approaches. Prerequisite: CSci 156. (Fall) (Rotenstreich)
- 153 **Design of Switching Systems (3)**  
Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse sequential circuits. State assignment and covers. May be taken for graduate credit except by majors in computer science. (Fall and Spring) (Friedman)
- 154 **Digital Computer Design (3)**  
Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals; binary and decimal, serial and parallel digital arithmetic units; memory subsystems, channels, I/O, and storage subsystems; the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. May be taken for graduate credit by students in fields other than computer science. Prerequisite: CSci 147 or 157, 150, 153. (Fall and Spring) (Meltzer)
- 155 **Introduction to Numerical Methods for Computers (3)**  
Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. May be taken for graduate credit. Prerequisite: ApSc 113, 115; CSci 51 or equivalent; a course in high-level computing. (Fall) (Youssef)
- 156 **Introduction to Operating Systems (3)**  
Introduction to operating systems, evaluation of operating systems services. Process management, process state, concurrent processing, synchronization, events. Operating system structure, the kernel approach, processor scheduling, task switching, monitors. System management, memory management, process loading, resource allocation, queue management, communication with periph-



- erals. File systems. Interactive computation. Protection systems. Performance evaluation. Prerequisite: CSci 160. (Fall and Spring) (Rotenstreich)
- 157 **Assembly Language Programming II** (3)  
Data types and numbering conventions. Organization of computers. Addressing modes. The instruction set and its use. Assembler operators and pseudo-operators. Interfacing to the operating system, I/O, and high-level languages. Macro and conditional pseudo-operations. Programming is carried out on a 16-bit machine, such as a member of the 8088 or 68000 family or a 65C02. May be taken for graduate credit by students in fields other than computer science. Prerequisite: CSci 147 or equivalent. (Fall and Spring) (Maurer)
- 159 **Programming and Data Structures** (3)  
Data structures used in computer programming and algorithms. Use of tree structures, arrays, lists, stacks, files, strings, and linked structures. Sorting, searching, hashing, and merging of data. Performance of algorithms using different data structures. May be taken for graduate credit by students in fields other than computer science. Prerequisite or concurrent registration: CSci 161. (Fall and Spring) (Feldman)
- 160 **Concepts of Programming Languages** (3)  
(Formerly CSci 158, *Algorithmic Methods*)  
Structure and application of high-level programming languages. Structural programming techniques. Development of nonnumeric algorithms. Use of recursion, data types, parsing, grammars, compiling, and BNF. Semantics of computer languages. Concepts in binding times, sequence and data control, run-time resources, and object language code. Introduction to translator and storage management. Comparison of computer languages. Team programming techniques and proper documentation of programs. May be taken for graduate credit by students in fields other than computer science. Prerequisite: CSci 147 or 157, 159. (Fall and Spring) (Heller)
- 161 **Discrete Structures for Computing** (3)  
Introduction to discrete mathematical structures that form the basis for computing. Sets, functions, and sequences. Propositional calculus, formal proofs, quantifiers, predicate calculus, mathematical induction. Matrices, semigroups, groups, homomorphism and isomorphism. Relations, partitions, equivalence relations, trees, directed and undirected graphs. May be taken for graduate credit by students in fields other than computer science. Prerequisite: CSci 51, Math 32. (Fall and Spring) (Maurer)
- 163 **Senior Computer Science Project Laboratory I** (2)  
Conception and design of a one-year project in hardware and/or software to be completed in CSci 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 122; CSci 150, 160; and senior status. (Fall) (Della Torre)
- 164 **Senior Computer Science Project Laboratory II** (2)  
Completion and construction of the project started in CSci 163. Oral and written presentation of the product designed. Prerequisite: CSci 163. (Spring) (Della Torre)
- 166 **Computer Science Laboratory I** (1)  
Experiments in support of the theory and design of microprocessor and micro-computer hardware and software. Use of microprocessors in control of systems. Use of simulators, cross-compilers, and development systems. Prerequisite or concurrent registration: EE 67 or 132; CSci 147, 150, 153. (Fall) (Meltzer)
- 167 **Computer Science Laboratory II** (1)  
Students undertake a class project, using a team approach in designing the subsystems needed to produce a complete digital computer system. Includes experience in software development, techniques for buses and local area networks, and design of input-output and memory subsystems. Prerequisite or concurrent registration: CSci 154, 156, 166. (Spring) (Meltzer)
- 171 **Computational Methods for Simulation** (3)  
Computational methods for continuous and discrete system simulation using both digital and analog computers. Effects of computer software and hardware



- architectures on computational precision and accuracy requirements. Random-number generation and testing. Calibration and scaling technique. Verification and validation technique. Class project: applications to games for small microcomputers. Graphics interfacing. Analysis of case studies. Prerequisite: CSci 155, 160. (Spring) (Bock)
- 173 **Theory of Computer Translators** (3)  
Lexical analysis, syntax analysis, data structures and operators, regular expressions, context-free grammars, parsing techniques, top-down parsing, efficient parsing, syntax-directed translation, intermediate formats, flow of control, block structures, procedure calls, symbol tables, run-time storage, error-detection and recovery, code optimization, code generation. Prerequisite: CSci 132. (Fall and Spring) (Maurer)
- 174 **Symbolic and Logic Processing for Artificial Intelligence** (3)  
Computation using lists as symbolic structures. Abstraction of process and data structures in symbolic and logic computation for artificial intelligence. Computation with lambda calculus or pure LISP in functional programming style. Computation using changes in the state of objects and processes; use of streams. The model of a LISP interpreter using EVAL or APPLY. Environments, object-centered programming, message passing. Symbolic logic and formal inference; unification and resolution. Course uses the SCHEME (dialect of LISP) and PROLOG languages. May be taken for graduate credit. Prerequisite: CSci 160. (Fall and Spring) (Garcia)
- 177 **Programming for Management Systems** (3)  
Intermediate programming course with application in business and government commercial programming. Emphasis on programming for accounting and management information systems. Use of file editing, report generation, and tapes. Course uses the COBOL language. Prerequisite: CSci 160. (Fall) (Bock)
- 178 **Introduction to Database Management** (3)  
Design and architecture of database systems. Query formulation, data models, data structures to minimize access time, relational data structures. Construction of a database management system. Survey of existing systems. Prerequisite: CSci 160. (Spring) (Rotenstreich)
- 185 **Interactive Computer Graphics I** (3)  
Two-dimensional interactive computer graphics. Relevant hardware; basic concepts and organization of graphics subroutine packages; programming concepts for interaction, display, and data structuring; basic clipping and scan-conversion algorithms; two-dimensional homogeneous coordinates. May be taken for graduate credit by students in fields other than computer science. Prerequisite: CSci 154, 160. (Spring)
- 188 **Distributed Computing Systems** (3)  
Connection of microprocessors and minicomputers into a distributed computing system. Use of shared memory and distributed data bases. Synchronization problems and concurrency in distributed systems. Shared bus structure, both loop and token passing. Geographically distributed systems and computer networks. Local area networks and point-to-point interconnections. Examples of systems. Prerequisite: CSci 151, 154. (Spring) (Meltzer)
- 197 **Special Topics in Computer Science** (1 to 3)  
Topic to be announced in the *Schedule of Classes*. (Fall and Spring)
- 198 **Research** (1 to 3)  
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Graduate Study

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of basic knowledge a stimulating opportunity for advanced study. The department offers programs leading to the Master of Science, professional, and Doctor of Science degrees. The student may concen-



trate in the following areas: systems science, networks, and controls; electro-physiology (electronics, fields, and waves); communications; medical engineering; computer science (artificial intelligence); computer science (hardware and systems); computer science (software and systems); energy conversion, power, and transmission; and telecommunications and computers.

The graduate programs are designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. A substantial number are offered during both the afternoon and the evening and alternate from year to year.

The department has continuously kept the graduate program up to date through research generated within the department and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The department periodically publishes a detailed brochure to supplement this *Bulletin*, with information about the procedures, requirements, regulations, and scope of its graduate programs. Pamphlets describing specific programs are also available.

**Colloquium Requirement.** Graduate students are required to attend several department colloquia each semester. These are intended to broaden the student's professional outlook and to encourage interaction with the faculty. Schedules are posted.

### Areas of Concentration

A doctoral student must select a minimum of three courses designated with an asterisk as part of his or her program in the major area.

### Communications

- EE 204: Stochastic Signals and Noise
- EE 205: Stochastic Processes in Electrical Engineering
- EE 208: Digital Image Processing
- EE 241: Information Theory
- EE 242: Coding Theory
- EE 243: Communication Theory I
- EE 244: Communication Theory II
- EE 245: Signal Detection and Estimation Theory
- EE 246: Digital Communications
- \*EE 247: Communications Systems
- EE 248: Computer Communication Networks I
- EE 249: Computer Communication Networks II
- \*EE 250: Telecommunications Security Systems
- \*EE 251: Switched Telecommunication Networks
- EE 252: Digital Signal Processing Techniques
- EE 254: Radar Systems
- \*EE 257: Secure Communications
- \*EE 258: Radio Communications Systems I
- \*EE 259: Radio Communications Systems II
- \*EE 277: Satellite Communications Systems
- EE 298: Research
- EE 299-300: Thesis Research
- \*EE 345: Advanced Detection Theory
- \*EE 346: Telecommunications Protocols
- \*EE 347: Telecommunications Software Engineering



EE 349: Communications Research

EE 399: Dissertation Research

**Computer Science (Core Courses)**

The following courses are required of all graduate degree candidates in computer science fields. With the approval of the advisor and the department chair, core courses may be waived on the basis of previous study.

CSci 154: Digital Computer Design

CSci 217: Computing Algorithms

CSci 232: Automata and Formal Languages

CSci 258: Advanced Programming Languages

**Computer Science (Artificial Intelligence)**

CSci 212: Discrete Analysis in Computer Science

CSci 215: Advanced Data Structures

\*CSci 220: Pattern Recognition

CSci 221: Machine Learning

\*CSci 224: Artificial Intelligence

\*CSci 226: Robotics

CSci 298: Research

CSci 299-300: Thesis Research

\*CSci 321: Advanced Machine Learning

\*CSci 322: Natural Language Understanding

\*CSci 324: Knowledge-Based Systems

CSci 391: Computer Science Research

CSci 399: Dissertation Research

EE 204: Stochastic Signals and Noise

**Computer Science (Hardware and Systems)**

CSci 203: Microprocessor System Design

CSci 212: Discrete Analysis in Computer Science

CSci 231: Sequential Machines

\*CSci 235: Parallel Computer Architecture

\*CSci 239: Comparative Computer System

\*CSci 240: Theory and Practice of Microprogramming

\*CSci 243: Fault-Tolerant Systems and Design Automation

CSci 244: Data Communications

\*CSci 245: Computer System Performance

CSci 298: Research

CSci 299-300: Thesis Research

\*CSci 335: Advanced Computer Architecture

\*CSci 337: VLSI System Organization and Applications

\*CSci 345: Advanced Computer System Performance

CSci 391: Computer Science Research

CSci 399: Dissertation Research

EE 126: Introduction to VLSI Design and Simulation

EE 127: VLSI Fabrication Techniques

EE 128: Testing and Simulation of VLSI Systems

EE 214: VLSI Design

EE 230: Physical Design of Memory Devices

**Computer Science (Software and Systems)**

CSci 215: Advanced Data Structures

CSci 216: Information Retrieval Systems



- CSci 219: Interactive Computer Graphics II
- CSci 222: Design of User-Computer Dialogues
- CSci 227: Management Information Systems and Database Management
- CSci 229: Computer Security Systems
- CSci 247: Languages for Systems Programming
- CSci 255: Analysis and Correctness of Algorithms
- \*CSci 256: Design of Translators
- \*CSci 267: Operating Systems I
- \*CSci 268: Operating Systems II
- \*CSci 270: Software Engineering
- CSci 281: Numerical Solutions of Algebraic Systems
- CSci 282: Numerical Solution of Ordinary Differential Equations
- CSci 298: Research
- CSci 299-300: Thesis Research
- \*CSci 319: Interactive Computer Graphics III
- \*CSci 327: Advanced Topics in Information Systems
- \*CSci 356: Seminar in Programming Language Design and Implementation
- \*CSci 358: Concurrency and Parallelism in Programming Languages
- CSci 391: Computer Science Research
- CSci 399: Dissertation Research

### Electrophysics (Electronics, Fields, and Waves)

- EE 201: Signals and Transforms in Electrical Engineering
- EE 206: Electromagnetic Theory and Applications I
- EE 207: Electromagnetic Theory and Applications II
- EE 221: Physical Electronics I
- EE 222: Physical Electronics II
- EE 223: Optical Communications Systems
- \*EE 224: Electronics of Lasers
- EE 225: Nonlinear Electronics
- \*EE 226: Fiber and Integrated Optics
- EE 227: Industrial Electronics
- EE 228: High-Frequency Electronics
- \*EE 232: Electrodynamics
- EE 233: Microwaves and Components
- \*EE 234: Wave Propagation in Inhomogeneous Media
- EE 235: Antennas
- \*EE 236: Plasma Dynamics
- \*EE 237: Waves in Random Media
- EE 238: Remote Sensing
- EE 239: Numerical Laboratory in Electromagnetics
- EE 255: Optical Processing
- EE 298: Research
- EE 299-300: Thesis Research
- \*EE 321: Approximate Mathematical Techniques for Electromagnetics
- \*EE 322: Advanced Waveguide Diffraction and Design
- \*EE 323: Principles of Microelectronics
- \*EE 329: Electrophysics Research
- \*EE 335: High-Resolution Antenna Array Processing Techniques
- EE 399: Dissertation Research

### Energy Conversion, Power, and Transmission

- EE 178: Electrical Power Systems
- EE 202: Linear Systems Theory I
- EE 206: Electromagnetic Theory and Applications I
- \*EE 261: Electromechanical Energy Conversion



- \*EE 262: Power Electronics
- EE 263: Design of Reliable Emergency and Standby Power Systems
- \*EE 264: Direct Electrical Energy Conversion
- EE 265: Transients in Electrical Power Transmission Lines
- EE 266: Electrical Power Transmission I
- EE 267: Electrical Power Transmission II
- EE 268: Electrical Power Distribution
- EE 269: Issues in Electrical Power Generation and Transmission
- EE 298: Research
- EE 364: Applications of Direct Energy Conversion
- EE 368: High-Voltage Testing Techniques for Electrical Apparatus
- EE 399: Dissertation Research

### Medical Engineering

- EE 280: Introduction to Medicine for Engineers I: Physiology and Anatomy
- EE 281: Introduction to Medicine for Engineers II: Physiology and Anatomy
- EE 282: Medical Measurements I
- EE 283: Medical Measurements II
- EE 285: Evoked Potentials I
- EE 287: Rehabilitation Medicine and Engineering
- \*EE 289: Clinical Medicine for Engineers
- EE 298: Research
- EE 299-300: Thesis Research
- \*EE 381: Computer-Aided Analysis of Physiological Signals
- \*EE 382: Physiological Controls and Systems
- \*EE 384: Medical Imaging
- \*EE 385: Evoked Potentials II
- \*EE 386: Bioelectromagnetics
- \*EE 389: Medical Engineering Research
- EE 399: Dissertation Research

### Systems Science, Networks, and Controls

- \*CSci 220: Pattern Recognition
- EE 202: Linear Systems Theory
- EE 203: Graph Theory and Applications
- EE 204: Stochastic Signals and Noise
- EE 212: Network Analysis
- \*EE 213: Computer-Aided Analysis and Design of Systems
- EE 214: VLSI Design
- EE 215: Linear Network Synthesis I
- \*EE 216: Synthesis of Active and Distributed Networks
- \*EE 218: Analog MOS VLSI Circuits for Signal Processing
- EE 219: Digital Filter: Design and Realization
- EE 252: Digital Signal Processing Techniques
- EE 262: Power Electronics
- \*EE 271: Linear Multivariable Control Theory
- EE 272: Computer Control Systems
- EE 273: Systems Optimization
- \*EE 274: Nonlinear Systems
- \*EE 275: System Identification and Adaptive Control Systems
- \*EE 279: Stochastic Control Systems
- EE 298: Research
- EE 299-300: Thesis Research
- EE 319: Systems Science, Networks, and Control Research
- \*EE 372: Analysis and Control of Large Systems
- EE 399: Dissertation Research



## Telecommunications and Computers

- CSci 159: Programming and Data Structures
- CSci 161: Discrete Structures in Computing
- CSci 216: Information Retrieval Systems
- CSci 217: Computing Algorithms
- CSci 227: Management Information Systems and Database Management
- CSci 229: Computer Security Systems
- CSci 230: Information Policy
- CSci 247: Languages for Systems Programming
- CSci 267: Operating Systems I
- CSci 268: Operating Systems II
- EAd 261: Economic Analysis in Engineering Planning
- EAd 262: Finance for Engineers
- EAd 281: Systems Analysis and Management I
- EE 144: Elements of Communications Engineering Design II
- EE 204: Stochastic Signals and Noise
- EE 205: Stochastic Processes in Electrical Engineering
- EE 242: Coding Theory
- EE 243: Communication Theory I
- EE 244: Communication Theory II
- EE 246: Digital Communications
- EE 248: Computer Communication Networks I
- EE 249: Computer Communication Networks II
- EE 250: Telecommunications Security Systems
- EE 251: Switched Telecommunication Networks
- EE 257: Secure Communications
- EE 258: Radio Communications Systems I
- EE 259: Radio Communications Systems II
- EE 346: Telecommunications Protocols
- EE 347: Telecommunications Software Engineering

## Master of Science Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. There are no required courses or programs of study, except for the core courses required in the computer science concentrations. Each student formulates an individualized program in consultation with an assigned faculty adviser. Faculty members who may serve as advisers are listed after each area.

*Communications:* Helgert, Heller, Kakaes, Lang, Newman, Pickholtz, Wasyliwskyj

*Computer Science (Artificial Intelligence):* Bock, Carroll, Della Torre, Foley, Garcia, Loew, Meltzer, Rotenstreich, Senay, Sibert, Zaghloul

*Computer Science (Hardware and Systems):* Alexandridis, Berkovich, Della Torre, Foley, Friedman, Garcia, Meltzer, Narahari, Senay, Youssef, Zaghloul

*Computer Science (Software and Systems):* Berkovich, Bock, Choi, Della Torre, Feldman, Foley, Heller, Hoffman, Martin, Maurer, Rotenstreich, Senay, Sibert

*Electrophysics (Electronics, Fields, and Waves):* Borgiotti, Heller, Kahn, Lang, Wasyliwskyj

*Energy Conversion, Power, and Transmission:* Harrington, Kahn, Lang

*Medical Engineering:* Eisenberg, Loew

*Systems Science, Networks, and Controls:* Carroll, Kyriakopoulos, Lee, Wasyliwskyj, Zaghloul



*Telecommunications and Computers:* Alexandridis, Helgert, Hoffman Kakaes, Meltzer, Newman, Pickholtz, Saha; Shane, Steiner (Engineering Administration)

### Admission Requirements

Admission to study toward a master's degree requires an appropriate bachelor's degree (one in engineering technology is normally not sufficient) from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by grades, scores on the Graduate Record Examination general test, and similar data. The applicant must be recommended for admission by the chair of the Department of Electrical Engineering and Computer Science; must have a quality-point index of at least 2.90 (on a scale of 4.00), or equivalent, for the last 60 semester hours of undergraduate work; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (four semesters beyond precalculus). Students are encouraged to submit GRE scores; those who do will be given preference in consideration for research and teaching fellowships. The regulations regarding transfer of credit also apply to courses taken as a nondegree student through the Division of Continuing Education at George Washington University.

The applicant must also have satisfied, through undergraduate studies, the following specific requirements according to the area of concentration.

#### *Communications*

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Electronics (3 semester hours—EE 20 or equivalent)
3. Communication theory (3 semester hours—EE 143 or equivalent)

#### *Computer Science*

1. Computer programming using assembly language, Pascal, and programming theory (9 semester hours—CSci 51, 147, and 160; or equivalent)
2. Computer hardware (6 semester hours—CSci 150 and 153, or equivalent)
3. Discrete mathematics and data structures (6 semester hours—CSci 159 and 161, or equivalent)

#### *Electrophysics*

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121, or equivalent)
3. Fields and waves (6 semester hours—EE 31 and 32, or equivalent)

#### *Energy Conversion, Power, and Transmission*

1. Network analysis using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Fields and waves (6 semester hours—EE 31 and 32, or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177 or equivalent)

#### *Medical Engineering*

Either:

1. Network theory (3 semester hours—EE 11 or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121, or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 100 or equivalent)



2. Computer hardware and software (6 semester hours—CSci 153 and 147, or equivalent)

#### *Systems Science, Networks, and Controls*

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, 113; or equivalent)
2. Electronics (3 semester hours—EE 20 or equivalent)
3. Control theory (3 semester hours—EE 172 or equivalent)

#### *Telecommunications and Computers*

1. Communication theory (3 semester hours—EE 143 or equivalent)
2. Computer science (6 semester hours—CSci 100, either 150 or 147; or equivalent)

Students with some undergraduate deficiencies may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a degree candidate.

#### *Program of Study*

Upon admission to the Master of Science program, the student is assigned a faculty adviser. The student and faculty adviser formulate a program of study, complete the Graduate Program of Studies (Form 1), and submit it to the department chair for approval. This form should be completed prior to or at the student's first registration. During consultation the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree consists of a minimum of 24 semester hours of graduate-level courses and 6 semester hours of thesis or, for the nonthesis option, a minimum of 33 semester hours of graduate-level courses. In both cases a student must select a minimum of three graduate courses outside his or her major area of concentration unless the student already has a graduate degree in another field.

For the thesis option, a minimum of 12 semester hours must be in the major field of concentration. For the nonthesis option, a minimum of 21 semester hours must be in the major field. In the case of an interdisciplinary program, no courses outside the major are required, but courses must be divided approximately equally between or among the disciplines chosen.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

#### *Master's Comprehensive Examination*

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day. The student is asked to solve several problems relating to the subject matter in his or her major area of study and must demonstrate the ability to apply what



has been learned. The examination is not limited to specific courses that the student has taken but is designed to demonstrate the student's ability to integrate material from several course areas and to learn from the readings.

A student who fails the Master's Comprehensive Examination on the first attempt may, in exceptional circumstances, be reexamined once more if approval is given by the appropriate examining committee and the department. If the student fails the examination on the second attempt, the student's graduate status is terminated.

### Professional Degree Program

Students may study for the professional degree in all graduate areas of concentration except telecommunications and computers. There are no required courses or programs of study, except for the core courses required in the computer science concentrations. Each student formulates an individualized program in consultation with an assigned faculty adviser.

### Admission Requirements

In addition to satisfying SEAS requirements for admission to study toward a professional degree, applicants to professional degree programs in the Department of Electrical Engineering and Computer Science must be recommended for admission by the chair of the department; must have a quality-point index of at least 3.0 (on a scale of 4.0) and two years of professional experience after obtaining the master's degree; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (calculus through differential equations).

The applicant must also have satisfied, through previous studies, the following specific requirements according to the area of concentration.

*Communications:* Nine semester hours of statistical theory of communications and 3 semester hours of information theory (EE 204, 241, 243, 244; or equivalent)

*Computer Science (Artificial Intelligence):* Fifteen semester hours of computer science and numerical methods at the graduate level (CSci 215, 217, 221, 224, 232; or equivalent)

*Computer Science (Hardware and Systems):* Twelve semester hours of computer design and theory at the graduate level (CSci 154, 215, 217, 232; or equivalent)

*Computer Science (Software and Systems):* Twelve semester hours of computer programming and theory at the graduate level (CSci 215, 217, 232, 258; or equivalent)

*Electrophysics:* Twelve semester hours of physical electronics and electromagnetics at the graduate level (EE 201, 206, 207, 221; or equivalent)

*Energy Conversion, Power, and Transmission:* Twelve semester hours of electrical machine theory and networks at the graduate level (EE 261, 262, 264, 266; or equivalent)

*Medical Engineering:* Twelve semester hours of medical engineering at the graduate level (EE 280, 281, 282, 283; or equivalent)

*Systems Science, Networks, and Controls:* Fifteen semester hours of network systems analysis at the graduate level, including a knowledge of state-space and linear graph theory (EE 202, 204, 212, 272, 273; or equivalent)



An applicant who does not meet the specific requirements, but meets all other admission requirements, may be admitted with a program of study that includes additional course work to cover the needed background material.

### Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student, which must contain a minimum of 30 semester hours of courses, and then complete the Graduate Program of Studies form. Programs of study and any subsequent changes must be approved by both the faculty adviser and the department chair.

The program of study for the professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major. A student who is changing his or her major area from that studied for the master's degree or who lacks specific admission requirements may have to take additional courses to make up deficiencies. Such additional work normally should not exceed 12 semester hours.

### Doctor of Science Degree Program

The Department of Electrical Engineering and Computer Science offers programs of study leading to the Doctor of Science degree in all graduate areas of concentration except telecommunications and computers. There are no required courses or programs of study, except for the core courses required in the computer science areas of concentration. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser. Special fields of each faculty member are listed below.

- N. A. Alexandridis: parallel processing and architectures, microprocessors, super computing systems architectures, multiprocessor systems, adaptable computer architectures, image processing
- S. Berkovich: information systems, data structures, associative memories and processors, computer organization, mathematical modeling
- P. Bock: computer science, artificial intelligence, robotics, simulation, programming languages, microprocessor systems
- G. V. Borgiotti: electromagnetic waves, signal processing, physical acoustics
- R. L. Carroll: control theory, adaptive systems
- H. A. Choi: design and analysis of algorithms, graph theory, combinational optimization, complexing theory
- R. Della Torre: numerical device modeling, magnetic recording and bubble memory and VLSI components, magnetic phenomena
- M. F. Eisenberg: medical engineering, thermography, evoked response, ultrasonics
- M. B. Feldman: computer science, programming languages, data structures, automata theory, software engineering
- D. Foley: interactive computer graphics, human factors of the man-machine interface, distributed processing and networking
- D. Friedman: computer architecture and organization, switching theory and logic design, microprocessors, diagnosis and fault-tolerant design of digital circuits, digital system design automation



- O. N. Garcia*: computer architecture, artificial intelligence, symbolic and logic processors, testing and reliability of digital systems
- R. J. Harrington*: simulation and control of electrical machinery and power systems, transient stability, transmission line switching transients, computer modeling
- H. J. Helgert*: communications and information theory, coding theory, data communications, computer networks
- R. B. Heller*: information processing, computer-to-computer communications networks, satellite communications, electromagnetic radiation
- R. S. Heller*: computer literacy, computers in education, programming languages
- L. J. Hoffman*: computer science, security and privacy, social implications
- W. K. Kahn*: antennas, microwave components, fiber optics, electrophysics
- A. K. Kakaes*: communications theory, computer communication networks, application of graph theory to communications networks
- N. Kyriakopoulos*: computer-aided network design, systems theory, control theory, digital filtering
- R. H. Lang*: wave propagation in random media, remote sensing, phase-locked loops, adaptive arrays
- T. N. Lee*: networks, linear systems
- M. H. Loew*: pattern recognition, medical engineering, image processing
- C. D. Martin*: computer literacy, computers in education, computers and society, LOGO
- W. D. Maurer*: computer science, correctness of programs, analysis of algorithms, semantics of programming languages
- A. C. Meltzer*: computer architecture, design of computer systems, database systems, multi-processor systems, hybrid computation
- B. Narahari*: parallel processing, algorithms and interconnection networks, reconfigurable parallel computer architectures, special purpose computing
- D. B. Newman, Jr.*: data communications, computer communication networks, detection and estimation theory
- R. L. Pickholtz*: data communications, computer communication networks, communications theory, secure communications
- D. C. Rohlfs*: specialized measurements and instrumentation, electronic devices, high-power HF systems, electronic circuitry
- S. Rotenstreich*: software engineering, operating systems
- D. Saha*: communication theory, modulation and coding techniques
- H. Senay*: artificial intelligence, human-computer interaction, logic programming, computer architecture
- J. L. Sibert*: computer graphics, human-computer interaction
- W. Wasylkiwskyj*: electromagnetic waves, propagation, signal processing, remote sensing
- A. Youssef*: interconnection networks, parallel computer architecture, parallel algorithms, algorithms and data structures, theory of computing
- M. Zaghloul*: computer-aided analysis and design, VLSI modeling, design, and testing

### Admission Requirements

In addition to satisfying SEAS requirements for admission to study toward the Doctor of Science degree, applicants to doctoral programs in the Department of Electrical Engineering and Computer Science must be recommended for admis-



sion by the chair of the department; must have a minimum quality-point index of 3.40 (on a scale of 4.00), or equivalent, in graduate course work leading to the master's degree; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (calculus through differential equations). Although knowledge of a foreign language is often advantageous in pursuing graduate study, there is no formal foreign language requirement for the Doctor of Science program in the department.

The applicant must also have satisfied, through previous studies, the following specific requirements according to the area of concentration (major area).

**Communications:** Nine semester hours of statistical theory of communications and 3 semester hours of information theory (EE 204, 241, 243, 244; or equivalent)

**Computer Science (Artificial Intelligence):** Fifteen semester hours of computer science and numerical methods at the graduate level (CSci 215, 217, 221, 224, 232; or equivalent)

**Computer Science (Hardware and Systems):** Twelve semester hours of computer design and theory at the graduate level (CSci 154, 215, 217, 232; or equivalent)

**Computer Science (Software and Systems):** Twelve semester hours of computer programming and theory at the graduate level (CSci 215, 217, 232, 258; or equivalent)

**Electrophysics:** Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level (EE 201, 206, 207, 221; or equivalent)

**Energy Conversion, Power, and Transmission:** Twelve semester hours of electrical-machines theory and networks at the graduate level (EE 261, 262, 264, 266)

**Medical Engineering:** Twelve semester hours of medical engineering at the graduate level (EE 280, 281, 282, 283; or equivalent)

**Systems Science, Networks, and Controls:** Twelve semester hours in network systems analysis at the graduate level, including a knowledge of state-space and linear graph theory (EE 202, 204, 212, 272, 273; or equivalent)

An applicant who does not meet the specific requirements, but meets all other admission requirements, may be admitted with a program of study that includes additional course work to cover the needed background material.

### Program of Study

At the time of admission, the student pursuing a Doctor of Science degree in the department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser during the first semester, the student determines the two minor areas of study. Together they formulate a program of study for the student that will lead to the qualifying examination, and they complete the Graduate Program of Studies form (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and department chair.

**Major Area.** The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas, including a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the master's level. A minimum of 15 semester hours must be taken in the major area, including a minimum of three courses designated with an asterisk on the list of areas of concentration. A student who is changing his or her major



area from that studied for the master's degree or who lacks specific admission requirements may have to take additional courses to make up deficiencies. Such additional work normally should not exceed 12 semester hours.

**Minor Areas.** Minor areas are not confined to the Department of Electrical Engineering and Computer Science but may be taken from other departments within the University, such as mathematics, statistics, operations research, and physics. Normally a minimum of three graduate-level courses constitutes a minor area. For those students whose major area of study is not computer science and who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses represent adequate programs in each minor area.

*Communications:* EE 204, 205 or 241, 243, and 244 or 249

*Computer Science (Artificial Intelligence):* CSci 159, 174, 221, 224

*Computer Science (Hardware and Systems):* CSci 150, 153, 154, 235

*Computer Science (Software and Systems):* CSci 159, 201, 217, 258

*Electrophysics:* EE 201, 206, 207, 221

*Energy Conversion, Power, and Transmission:* EE 261, 262, 264, 266

*Medical Engineering:* EE 280, 281, 282, 283

*Systems Science, Networks, and Controls:* EE 202, 212, 272, 273

**Qualifying Examination.** The qualifying examination for doctoral students in the department is composed of two parts. The first part is the department's Master's Comprehensive Examination in the major area, on which the student must demonstrate superior performance in order to qualify as a doctoral student. This requirement is waived for those who received the M.S. degree from the department and, within two years prior to entering the doctoral program, demonstrated superior performance on the comprehensive examination. All other incoming students must take the comprehensive within three semesters of the date of admission to the doctoral program or, for those entering as unclassified students because of stated course deficiencies, within five semesters of first registration as an unclassified student. A student who fails to demonstrate superior performance must take the examination again in one of the two following semesters. A student may take the comprehensive only twice. Failure to show superior performance on the second try will result in termination of the student's candidacy.

The student takes the second part of the qualifying examination upon completion of the formal program of study. The purpose of this part is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the major area. It normally consists of two sections, each of one day's duration. One section, a written and/or oral examination covering the major area of study, is given only in the spring semester. The other, a written and/or oral examination covering one minor area, is given in the fall and spring. Additional oral examinations may be required. The student must pass both sections of this examination within, at most, two semesters of the semester in which any section is first attempted. A candidate who fails either section of the examination on the first attempt may take that section once more, if the examining committee approves and the time limit is not exceeded. Failure to pass the qualifying examination will terminate the student's doctoral candidacy.

The questions on the qualifying examination are not limited to the areas in which the student has taken course work but are designed to demonstrate the student's ability to integrate material from several areas and from individual study. The student should be familiar with the contents of current journals and



with the books on the reading lists for both the areas of examination and the courses taken.

**Dissertation.** After passing the qualifying examination, the student makes arrangements for the assignment of a research director (not necessarily the student's faculty adviser), who selects an appropriate advisory committee. The advisory committee monitors the student's dissertation development and, in conjunction with the research director, gives guidance to the student. After the student completes the dissertation, the advisory committee becomes the examining committee, with the addition of at least one new person. The dissertation should be of such quality that all or part is suitable for publication. Doctoral students are encouraged to publish their work.

## Graduate Courses

In addition to the Electrical Engineering and Computer Science graduate courses described below, the following undergraduate courses may be taken for graduate credit if they are included in the student's approved program of study. Students considering these courses should consult with their adviser. See the undergraduate section for course descriptions and restrictions.

- EE 126: Introduction to VLSI Design and Simulation
- EE 127: VLSI Fabrication Techniques
- EE 128: Testing and Simulation of VLSI Circuits
- EE 144: Elements of Communications Engineering Design II
- EE 169: Advanced Electronics Design Laboratory
- EE 178: Electrical Power Systems
- EE 184: Introduction to Medical Engineering
- CSci 147: Assembly Language Programming I
- CSci 153: Design of Switching Systems
- CSci 154: Digital Computer Design
- CSci 155: Introduction to Numerical Methods for Computers
- CSci 157: Assembly Language Programming II
- CSci 159: Programming and Data Structures
- CSci 160: Concepts of Programming Languages
- CSci 161: Discrete Structures for Computing
- CSci 174: Symbolic and Logic Processing for Artificial Intelligence
- CSci 185: Interactive Computer Graphics I

## Electrical Engineering Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

- 201 **Signals and Transforms in Electrical Engineering (3)**  
(Formerly *Natural Modes and Transients in Electrical Systems*)  
Fourier transforms, singularity functions, functions of a complex variable, calculus of residues, techniques of contour integration, integral representation of special functions. The unilateral and bilateral Laplace transforms, Fourier transforms in the complex domain, causal and analytic signals, Hilbert transforms, the  $z$ -transform and its relationship to Fourier series and discrete Fourier transforms. (Fall and Spring) (Wasyliwskyj)
- 202 **Linear Systems Theory (3)**  
Introduction to linear systems theory. Topics include linear vector spaces and linear operators, mathematical representation of dynamic linear systems, con-



- cept of state and solution of the state equation, controllability and observability, canonical forms of the state equation, state feedback, and state estimation. (Spring and Fall) (Zaghloul)
- 203 **Graph Theory and Applications** (3)  
Introduction to oriented and nonoriented graphs. Topics may include graph theory applications to the routing problems of multiple printed circuits; circuit concepts of linear vector spaces; network analysis and synthesis, topological formulas; paths, reachability, connectedness, tree representations, transportation flows, and communications networks. Computer science applications such as storage representation and manipulation of computer data and other related techniques. (Spring, even years) (Kakaes)
- 204 **Stochastic Signals and Noise** (3)  
Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSc 115 or equivalent. (Fall and Spring) (Saha)
- 205 **Stochastic Processes in Electrical Engineering** (3)  
Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth-death process, applications to queuing theory, buffer problems, and the design of communications nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communications theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring) (Saha)
- 206 **Electromagnetic Theory I** (3)  
Review of vector calculus. Electrostatic fields from monopolar and dipolar distributions in a vacuum, theory of multipoles, fields in material media, boundary conditions, classical potential theory, uniqueness theorem, Green's functions. Solution of electrostatic problems, including separation of variables and Green's function techniques. Energy relations and forces. Steady currents and their interaction, the magnetic induction field, vector potential, multipole expansion, volume distribution of magnetic dipoles, magnetostatic fields in material media, magnetic field intensity and scalar potentials, boundary conditions, forces and energy in magnetostatics. Prerequisite: EE 133 or equivalent; concurrent registration: EE 201. (Fall) (Lang)
- 207 **Electromagnetic Theory II** (3)  
Review of vector calculus. Maxwell equations for stationary media, Faraday's law for moving media. The wave equation, solution of scalar wave equation for general time-varying sources, Poynting vector for time-varying and time-harmonic fields, plane waves in free space, phase and group velocity, inhomogeneous plane waves. Isotropic dielectrics and conducting media, polarization, reflection and refraction of plane waves at planar boundaries, radiation from sources in free space. Use of potentials, electromagnetic fields due to electric and magnetic currents, dyadic Green's function. Far field approximation, radiation by idealized antennas, field equivalence principles. Prerequisite: EE 32 or equivalent; prerequisite or concurrent registration: EE 201. (Spring) (Lang)
- 208 **Digital Image Processing** (3)  
Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, cosine, and Hadamard. Methods of image enhancement and restoration. Image coding and data compression techniques. Automated image analysis and recognition. Computer applications and projects. Prerequisite: EE 204. (Spring) (Loew)



**212 Network Analysis (3)**

Network theorems, functions, and properties; relationship of parts of network functions; realizability and causality concepts. Introduction to the theory of nonlinear networks, nonlinear resistive network equation formulation, hybrid and other nonlinear equations. Nonlinear dynamic network equation formulation, state space, conditions for existence. Concepts of stability in nonlinear networks, conservative and Lagrangian networks and systems.  
(Fall, odd years) (Zaghloul)

**213 Computer-Aided Analysis and Design of Systems (3)**

Numerical solution of algebraic set of equations, Newton-Raphson and modified Newton-Raphson techniques, solution of algebraic equations with multiple solutions. Numerical solution of nonlinear ordinary differential equations for stable and stiff systems. Numerical optimization techniques. Linear and nonlinear programming. Computer-aided sensitivity analysis of networks. Application in the design of large systems and in automated design. Prerequisite: EE 202 or 212.  
(Fall, odd years) (Zaghloul)

**214 VLSI Design (3)**

Advanced design and analysis techniques for VLSI circuits. Design of reliable VLSI circuits, noise consideration, worst-case design. Design and optimization of large fan-out and fan-in circuits clocking methodologies. Techniques for datapath and data-control design. Simulation techniques. Students design VLSI circuits using CAD computer and simulate design. Prerequisite: EE 126, undergraduate degree in electrical engineering, or permission of instructor.  
(Fall, even years) (Zaghloul)

**215 Linear Network Synthesis I (3)**

Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott-Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of course director.  
(Fall, even years) (Lee)

**216 Synthesis of Active and Distributed Networks (3)**

Active network synthesis using negative resistors, control sources, NIC, operator, and operational amplifiers. Uniform and nonuniform distributed network analysis and synthesis—computer-aided design. Prerequisite: EE 215.  
(Spring, odd years) (Lee)

**218 Analog MOS VLSI Circuits for Signal Processing (3)**

MOS devices as circuit elements, MOS technology, analog MOS building blocks, MOS capacitors, limitation, low-noise design techniques, design of switched-capacitor circuits, A/D converters. Layout examples and design principles. Students use the CAD VLSI laboratory to design and simulate circuits. Prerequisite: EE 126 or equivalent.  
(Fall, even years) (Zaghloul)

**219 Digital Filter: Design and Realization (3)**

Properties of transfer functions. Filter approximation, sensitivity, and computation techniques. Digital signals and systems, basic block of digital filters, stability consideration. Analysis of digital filters. Design of IIR and FIR digital filters. Computation techniques. Direct and indirect realization of digital filters. Microprocessor implementation. Applications and selected papers. Prerequisite: EE 202 or permission of course director.  
(Spring, odd years) (Zaghloul)

**221 Physical Electronics I (3)**

Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics.  
(Fall) (Wasyliwskyj)

**222 Physical Electronics II (3)**

The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221.  
(Spring) (Wasyliwskyj)



**223 Optical Communications Systems (3)**

Optical communications channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photo-diodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical-fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optical-fiber cabling, repeaters, and systems analysis; integrated optical components. Prerequisite: EE 207, 243.

(Spring, odd years) (Kahn)

**224 Electronics of Lasers (3)**

Basic concepts from quantum mechanics, Einstein coefficients, inversion and pumping mechanisms, rate equations. Resonators, He-Ne laser; organic dye lasers, injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall 1990 and every third year thereafter) (Kahn)

**225 Nonlinear Electronics (3)**

Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators. Study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall, even years) (Heller)

**226 Fiber and Integrated Optics (3)**

Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos-Haenchen shift, Hamiltonian formalism. Directional couplers, modulators, and deflectors in fibers and surface films. Coupled-mode theory. (Spring, even years) (Kahn)

**227 Industrial Electronics (3)**

Applications of electronic devices in industry, continuous and sampled control systems, induction and dielectric heating, timing and counting circuits, reliability and automatic checking equipment, digital control of machine tools. Prerequisite: EE 201 or equivalent and graduate status. (Fall, odd years) (Heller)

**228 High-Frequency Electronics (3)**

Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communications systems. Prerequisite: EE 207 or equivalent. (Spring, even years) (Heller)

**230 Design of Memory Devices (3)**

Physical principles of magnetic and semiconductor memory devices. Design and manufacture of Ram's and disk files. Device and system characteristics reliability. Prerequisite: EE 122. (Spring, odd years) (Della Torre)

**232 Electrodynamics (3)**

Special theory of relativity and the Lorentz transformation, Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring 1991 and every third year thereafter)

**233 Microwaves and Components (3)**

High-frequency transmission lines and guided systems, matching techniques, scattering parameters, transfer parameters, directional couplers, cavity resonators, Faraday rotation, ferrite isolators and circulators. Prerequisite: EE 207. (Fall—evening) (Kahn)

**234 Wave Propagation in Inhomogeneous Media (3)**

(Formerly *Electromagnetic Wave Propagation*)

Electromagnetic and acoustic propagation in inhomogeneous media, WKB approximation, geometrical optics, layered media. Stationary phase and steepest descent evaluation of integrals, using techniques of functions of a complex variable; application to field computation at caustics; waves guided by ducts. Illustrations drawn from ocean acoustics and electromagnetic wave propagation in the ionosphere. Prerequisite: EE 201. (Spring, even years) (Wasyliwskyj)



- 235 **Antennas (3)**  
General solution of Maxwell's equations in terms of current sources, polarization, the far-field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring, odd years) (Kahn)
- 236 **Plasma Dynamics (3)**  
Study of the interaction of fluids with electromagnetic fields. Generalized Navier-Stokes and energy equations, magnetogasdynamic and magneto-hydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized von Kármán-Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Fall 1989 and every third year thereafter)
- 237 **Waves in Random Media (3)**  
Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communications channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, even years) (Lang)
- 238 **Remote Sensing (3)**  
Description and analysis of active and passive remote-sensing systems including scatterometers, real-aperture imaging, and synthetic-aperture radars. Sensing of surface, subsurface, and atmospheric parameters at microwave, infrared, and optical frequencies. Analysis of radiometric techniques using radiative transport theory, inverse scattering methods, profile inversion. Prerequisite: EE 207. (Spring, odd years) (Lang)
- 239 **Numerical Laboratory in Electromagnetics (3)**  
Numerical methods for the solution of electromagnetic problems dealing with scattering by complex shapes, antenna design, transmission through anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: CSci 100, EE 207. (Spring, even years) (Kahn)
- 241 **Information Theory (3)**  
Measure of information, noiseless coding. Communication channels, channel capacity, the noisy channel coding theorem. Bounds on the performance of communications systems. The Gaussian and binary symmetric channel. Feedback communications systems. Rate-distortion theory. Prerequisite: EE 204. (Fall) (Pickholtz)
- 242 **Coding Theory (3)**  
The PCM communication system, mathematics of coding; groups, rings, and fields. Linear codes: parity and generator matrices, syndrome error correction and deletion capability, minimum distance. Performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation. Cyclic codes: implementation and performance. BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring) (Pickholtz)
- 243 **Communication Theory I (3)**  
Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall and Spring) (Pickholtz)



**244 Communication Theory II (3)**

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring) (Pickholtz)

**245 Signal Detection and Estimation Theory (3)**

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous waveforms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244, or equivalent. (Fall) (Pickholtz)

**246 Digital Communications (3)**

Analysis and design of digital communications systems for voice, video, and data. Digital coding of waveforms: uniform and nonuniform quantization, pulse-code modulation, digital multiplexers, and digital system hierarchy. Model and performance characterization of digital communications systems, baseband signaling technique, efficient modulation techniques for band-limited channels, baseband shaping and Nyquist criteria, intersymbol interference (ISI) and eye diagrams, partial response signaling, application of Viterbi algorithm to data transmission, system performance in presence of ISI and additive white Gaussian noise, optimization of two-dimensional signal constellations. Baseband representation of band-pass signals; BPSK, DPSK, QPSK, SQPSK, and MSK: power spectrum and performance; concept of multi- $h$  modulations; practical considerations in design of modems. Digital switching and integrated services digital networks. Prerequisite: EE 244. (Fall) (Pickholtz)

**247 Communications Systems (3)**

Analysis and design of digital communications systems. Generation of coherent references: phase-locked loops, linear and nonlinear model of PLL in the presence of additive noise, optimum design of PLL. Synchronization of digital communications systems: maximum-likelihood parameter estimation and application in carrier-phase and symbol-timing recovery, performance degradation due to imperfect phase and bit timing, frame synchronization techniques and application to PCM and TDMA systems, synchronization of switched digital communications networks. Spread-spectrum signals for digital communications, digital switching and integrated services digital networks, selected topics in design of digital communications networks, case studies. Prerequisite: EE 244 or equivalent. (Spring) (Saha)

**248 Computer Communication Networks I (3)**

Circuit- and packet-switched networks, local and wide area networks, network topologies. Communications architectures, the OSI Reference Model, information models. Data transmission techniques, synchronous and asynchronous communications, baseband signaling modems. Frequency- and time-division multiplexing, error-control techniques, data link control. Point-to-point and multipoint configurations, flow control, bisynch and HDLC procedures. Network protocols for packet- and circuit-switched networks. Should be taken in sequence with EE 249. Prerequisite: EE 144 or equivalent. (Fall and Spring) (Helgert)

**249 Computer Communication Networks II (3)**

Design and analysis of computer communication networks. Circuit and packet switching. Traffic theory for data. Queuing models. Buffer design and statistical multiplexing. Delay and cost minimization, topological design algorithms. Network routing and flow control. Analysis of multiple-access algorithms. Prerequisite: EE 204, 248. (Spring) (Helgert)

**250 Telecommunications Security Systems (3)**

Mathematical theory of cryptography. Speech and data scrambling. Nonlinear transformations. Block and stream ciphers. DES algorithm and public key



cryptography. Applications to data communications. Key management, digital signatures, and authentication. Data communication security protocols, OSI security architecture. Transaction-oriented security. Secure voice communications. Companion course to CSci 229. Prerequisite: EE 204.  
(Spring, odd years) (Newman)

251 **Switched Telecommunication Networks** (3)

Switching technology: step-by-step, common control, stored program, electronic switching systems. Traffic models. Engineering of multiple server systems; analysis of multistage connecting networks. Digital time division and store and forward switches. Analytical bounds on the complexity of switched networks. Hybrid circuit-message switching. Large-scale switches, PEABX, and distributed switched networks. Prerequisite: permission of course director.  
(Spring, even years) (Kakaes)

252 **Digital Signal Processing Techniques** (3)

Signal representations, sampling and quantization, transform techniques. Recursive estimation, linear predictive filtering, recursive and nonrecursive digital filter design. Computer-aided design. Prerequisite: CSci 51 or equivalent.  
(Fall, even years) (Kyriakopoulos)

254 **Radar Systems** (3)

The radar range equation. Radar cross section of targets, target detection and parameter estimation, detection in clutter. Resolution, ambiguities, and signal design. Moving-target indicators. Pulse Doppler radar, radar antennas, phased arrays. Synthetic aperture and space-based radar. Prerequisite: EE 204, 207.  
(Spring) (Borgiotti)

255 **Optical Processing** (3)

Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201.  
(Fall, even years) (Kahn)

257 **Secure Communications** (3)

Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Low probability of intercept. Prerequisite: EE 243.  
(Fall, even years) (Pickholtz)

258 **Radio Communications Systems I** (3)

Analysis and design of microwave communications systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of Earth curvature and characteristics of overland and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244.  
(Fall) (Lang)

259 **Radio Communications Systems II** (3)

Morphology of the ionosphere, propagation of ionospherically reflected radio waves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-Gaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor.  
(Spring) (Lang)

261 **Electromechanical Energy Conversion** (3)

Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements. Steady-state and dynamic performance of alternating current machines. Prerequisite: EE 202, 206, or permission of course director.  
(Fall) (Harrington)

262 **Power Electronics** (3)

Dynamic requirements of industrial drives. Detailed analysis of inverter circuits. Frequency control of inverter drives and cycloconverters. Computer mod-



- eling of rectifier and inverter circuits. Feedback control loops and their effect on stability. Prerequisite: EE 177 or permission of course director. (Spring) (Harrington)
- 263 **Design of Reliable Emergency and Standby Power Systems (3)**  
General requirements and guidelines. Factors affecting power-line disturbances. Characteristics and settings of system protection. Disturbance effects on computer power supplies. Grounding and noise control. Evaluation of reliability of power systems. Reliability evaluation from an economic viewpoint. Cost of power outages. Reliability of specific equipment. Practical application problems. Prerequisite: EE 202, 206, or permission of course director. (Spring) (Harrington)
- 264 **Direct Electrical Energy Conversion (3)**  
Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid-state energy bands, work function and conversion efficiency, and limitations. Prerequisite: EE 202, 206, and permission of course director. (Fall) (Harrington)
- 265 **Transients in Electrical Power Transmission Lines (3)**  
Theory of traveling wave phenomena in electrical power transmission lines. Switching and lightning surges and the resultant overvoltages on long lines for various terminations. Breaker closing sequence effects and effect of source side inductance and multiple infeeds. Recovery voltage after short line faults. Methods and effectiveness of protection. Analysis of transient corona and its effect on wave shape. Methods of automatic calculation of overvoltages in complex systems and insulation level requirements. Prerequisite: EE 202, 206, or permission of course director. (Fall, odd years) (Harrington)
- 266 **Electrical Power Transmission I (3)**  
EHV AC power transmission. Overhead line and underground cable transmission systems. Symmetrical components; short-circuit studies; load flow, transient stability, and sustained fault analysis; multimachine systems; machine and system modeling. Prerequisite: EE 178, 261, 265. (Spring, even years) (Harrington)
- 267 **Electrical Power Transmission II (3)**  
Practical studies using a computer in the following areas: load-flow analysis, short-circuit analysis, transient stability, design of power system networks, insulation coordination. Prerequisite: EE 266. (Fall, even years) (Harrington)
- 268 **Electrical Power Distribution (3)**  
Transformer and insulation design at distribution voltage levels. Medium- and low-voltage switchgear requirements. Protective relaying, harmonic filtering, power-factor correction, grounding systems. Prerequisite: EE 178, 202, and permission of course director. (Spring, odd years) (Harrington)
- 269 **Issues in Electrical Power Generation and Transmission (3)**  
Assessment of various energy systems. Interfacing of different types of energy systems. Dispersed generation; concepts of conversion and cogeneration. Pollution control. Biological effects of high electric and magnetic fields. Prerequisite: EE 264, 267, and permission of course director. (Spring, odd years) (Harrington)
- 271 **Linear Multivariable Control Theory (3)**  
Control of systems having multiple inputs or outputs. Topics useful in the control of multivariable systems, including the algebraic theory of multivariable feedback; static and dynamic decoupling; invertibility; modal control; integrity; and computer-aided frequency-domain techniques, such as feedback design, using inverse Nyquist arrays and characteristic loci design. Prerequisite: EE 172, 202, or equivalent. (Spring, even years) (Carroll)
- 272 **Computer Control Systems (3)**  
Analysis of automatic control systems in which the control procedure uses on-line digital computation. Topics include single- and multirate sampling, z-transforms, responses of discrete systems, stability criteria, and discrete control design. Prerequisite or concurrent registration: EE 202. (Fall) (Carroll)



- 273 System Optimization (3)**  
Parameter optimization problems, theory of minima and maxima. Optimization problems for dynamic systems, calculus of variations, the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints, optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 202 or equivalent. (Spring) (Carroll)
- 274 Nonlinear Systems (3)**  
Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov asymptotical method, and Tsytkin locus. Forced oscillations—jump resonance. Stability analysis—Liapunov criterion. Luré problem and Popov method. Prerequisite: EE 202. (Spring, odd years) (Carroll)
- 275 System Identification and Adaptive Control Systems (3)**  
Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control is the means whereby a system that is poorly modeled is adequately controlled. Various approaches to each of these problems are discussed, including the least-squares approach of identification and the stability approach to adaptive control. Prerequisite: EE 202, 204. (Spring, even years) (Carroll)
- 277 Satellite Communications Systems (3)**  
Theory and applications of satellite communications. Modulation and multiple-access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random-access techniques and satellite packet communications. Prerequisite: EE 244. (Fall) (Pickholtz)
- 278 Spacecraft Systems Design (3)**  
Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and reentry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years) (Heller)
- 279 Stochastic Control Systems (3)**  
Introduction to random process in control systems. Properties of Markov process, systems of covariance equivalence and of deterministic and stochastic control equivalence; dynamic programming for Markov process—principle of optimality; linear systems with quadratic cost, Kalman filtering, smoothing, and predicting. The separation theorem and applications concepts of adaptive estimations. Prerequisite: EE 204, 273. (Fall, odd years) (Lee)
- 280 Introduction to Medicine for Engineers I: Physiology and Anatomy (3)**  
The physiology of the human body from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs and related to the various systems of the body; interrelationships of the body systems, such as the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall) (Eisenberg)
- 281 Introduction to Medicine for Engineers II: Physiology and Anatomy (3)**  
Further elaboration of physiological systems, such as the endocrine system, renal physiology, gastrointestinal physiology; integration of the separate systems to present the functioning of the body as an overall system. Prerequisite: EE 280. (Spring) (Eisenberg)
- 282 Medical Measurements I (3)**  
Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology, stressing electronic systems. Prerequisite: EE 280 or permission of course director. (Fall—evening) (Eisenberg)
- 283 Medical Measurements II (3)**  
Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 280 or permission of course director. (Spring) (Eisenberg)



- 285 **Evoked Potentials I (3)**  
Physiological significance of the sensory-evoked potentials, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 281, 282, 283; or permission of course director. (Fall) (Eisenberg)
- 287 **Rehabilitation Medicine and Engineering (3)**  
Cross-sectional view of those areas of medicine most involved with the treatment of handicapped individuals. Application of engineering theory and techniques to the rehabilitation of handicapped individuals. Major problem areas and general solutions, solutions to some specific problems. Prerequisite: EE 289. (Spring, odd years) (Eisenberg)
- 289 **Clinical Medicine for Engineers (3)**  
Overview of clinical medicine with emphasis on those areas most affected by engineering and technology. Prerequisite: EE 281, 282, 283. (Fall, even years) (Eisenberg)
- 297 **Special Topics in Electrical Engineering (1 to 3)**  
Topic to be announced in the *Schedule of Classes*. (Fall and Spring)
- 298 **Research (arr.)**  
Applied research and experimentation projects, as arranged. May be repeated for credit. (Fall and Spring)
- 299-300 **Thesis Research (3-3)**  
(Fall and Spring)
- 319 **Systems Science, Networks, and Controls Research (arr.)**  
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)
- 321 **Approximate Mathematical Techniques for Electromagnetics (3)**  
Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow boundary. Perturbation techniques for tenuous medium: Rayleigh-Gans approximation, smoothing, and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring 1988 and every third year thereafter) (Lang)
- 322 **Advanced Waveguide Diffraction and Design (3)**  
Selections from the following. Analytical treatment of waveguide bifurcations and discontinuities by Wiener-Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall, every third year) (Kahn)
- 323 **Principles of Microelectronics (3)**  
Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years) (Heller)
- 329 **Electrophysics Research (arr.)**  
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)
- 335 **High-Resolution Antenna Array Processing Techniques (3)**  
Review of electromagnetic-wave propagation; radiation and reception by array antennas; antenna arrays as multipoint receivers; signal and noise models for radar detection and wave-front reconstruction. Angle-of-arrival estimation using the maximum entropy, autoregressive moving-average techniques, and singular-value decomposition. Application to radar multipath problems, low-elevation tracking radar, and angle-of-arrival estimation. Prerequisite: EE 204, 207. (Fall, even years) (Wasyliwskyj)
- 345 **Advanced Detection Theory (3)**  
Review of general estimation equations. Linear estimation, Weiner and Kalman-Bucy filters, nonlinear modulation theory. Angle-modulation systems,



analysis and design of phase-lock loops, optimum angle modulation, rate-distortion theory. Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple-pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring) (Pickholtz)

346 **Telecommunications Protocols** (3)

Layered protocol models for computer communications networks. Open systems interconnection reference model. CCITT and ISO protocol standards in support of OSI. Proprietary communications architectures. SNA and DNA. Protocols for local area networks and integrated services digital networks. Prerequisite: EE 248. (Fall) (Helgert)

347 **Telecommunications Software Engineering** (3)

Formal description techniques for protocol specification. Graphic and matrix representations of finite-state protocol models. Specification and Description Language (SDL) and CCITT High-Level Language (CHILL). Software implementations of computer communications protocol architectures. Network management and control programs, telecommunications access methods, file transfer programs, electronic mail systems, and document interchange architectures. Terminal emulations. Selected programs for OSI and SNA link, network, transport, and session layers. Prerequisite: EE 346. (Spring) (Helgert)

349 **Communications Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

364 **Applications of Direct Energy Conversion** (3)

Electrostatic and magnetic conversion systems, conversion of heat to electricity, thermoelectric systems, conversion of light to electricity, fuel cells and batteries, magnetohydrodynamic systems, superconductive machines and systems. Prerequisite: EE 264. (Spring, even years) (Harrington)

368 **High-Voltage Testing Techniques for Electrical Apparatus** (3)

Methods and procedures for measurement of high voltage; basic testing techniques for alternating voltages, direct voltages, lightning-impulse voltages, switching-impulse voltages, and impulse currents for conducting tests on all types of apparatus. General applications and requirements regarding test objects and test procedures. Determination of the dielectric strength of electrical insulation materials at commercial power frequencies. The use of sphere gaps for the measurement of peak values; the geometry of the standard sphere gap, its connections and use. Procedures for wet tests, contamination testing, and an application guide for measuring devices. (Spring, even years) (Harrington)

371 **Simulation Methods for System Analysis** (3)

Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of course director. (Fall, odd years) (Bock)

372 **Analysis and Control of Large Systems** (3)

Systems as multistage decision processes. Analytical concepts of model making and matrix representations of large systems. Approximation by models of lower dimension: reduction to simplified models, decentralized systems. Differential games, computation of saddle points, construction of an equilibrium point. Prerequisite: EE 273. (Fall, even years) (Lee)

381 **Computer-Aided Analysis of Physiological Signals** (3)

Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems, preprocessing of real signals, algorithmic techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent med-



- ical parameters as established by physicians. Prerequisite: EE 281, 282, 283. (Fall, even years) (Loew)
- 382 **Physiological Controls and Systems (3)**  
Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisite: EE 172 or equivalent, 281, 282, 283. (Spring, even years) (Loew)
- 384 **Medical Imaging (3)**  
Principles of medical imaging by projection radiography, fluoroscopy, tomography, ultrasound, and nuclear sources. Characterization of source and object; recorder resolution and noise; analysis of scatter, energy considerations; attenuation; computerized tomography. Mathematics, algorithms, and implementation. Ultrasonic imaging in A-, B-, and M-modes; tissue characteristics; imaging using arrays. Nuclear imaging with gamma-ray cameras, Anger camera, positron-emission tomography. Prerequisite: EE 201 or equivalent, 280, 282, 283. (Fall, odd years) (Loew)
- 385 **Evoked Potentials II (3)**  
Continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research, with emphasis on clinical applications. Planning and conducting of an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background in instrumentation, computers, and data analysis. Prerequisite: EE 285 and permission of course director. (Spring, odd years) (Eisenberg)
- 386 **Bioelectromagnetics (3)**  
Electrical properties of biological tissues. Mechanisms for electromagnetic interactions with biological systems. Energy absorption and heat production. Non-ionizing radiation dosimetry and quantification of microwave and radio frequency hazards. Temperature measurement in the presence of a strong electromagnetic field. Physical aspects of diathermy and hyperthermia. Other therapeutic and diagnostic applications of electromagnetic energy. Prerequisite: EE 32, 281; or permission of instructor. (Fall, odd years) (Eisenberg)
- 387 **Bioelectric Phenomena (3)**  
Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics, membrane electrical potentials and subthreshold membrane effects, membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 280, 282, 283. (Spring, even years) (Loew)
- 389 **Medical Engineering Research (arr.)**  
Limited to students working on the Doctor of Science dissertation. May be repeated for credit. (Fall and Spring)
- 390 **Colloquium (0)**  
Lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)
- 399 **Dissertation Research (arr.)**  
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)
- 450 **Principles of Telecommunications (3)**  
(Formerly *Telecommunications System Concepts*)  
Essential elements of telecommunications system, representation of signals in the frequency domain, the baseband frequency spectra, and bandwidths of voice, data, and video signals. Signal and noise power, distortion, and channel capacity. Modulation, multiplexing, and digital communications. May not be applied toward a graduate degree in the School of Engineering and Applied Science. (As arranged) (Pickholtz)



- 451 **Telecommunications Transmission Systems** (3)  
(Formerly *Survey of Telecommunications Systems*)  
Introduction to the use of microwave, fiber-optic, and satellite computer communications systems. Local area networks, packet-switched networks, routing algorithms, and performance. May not be applied toward a graduate degree in the School of Engineering and Applied Science. Prerequisite: EE 450 or permission of instructor. (As arranged) (Pickholtz)
- 452 **Applications of Telecommunications Technologies** (3)  
Advanced topics and recent technological developments in telecommunications, including traffic theory, switching systems, error detection and correction, ISDN, cellular radio systems, and security and privacy in communications. May not be applied toward a graduate degree in the School of Engineering and Applied Science. Prerequisite: EE 451 or equivalent. (As arranged) (Pickholtz)

## Computer Science Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

- 201 **Introduction to Computer Systems** (3)  
Introduction to programming digital computers in high-level and assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Software engineering. Introduction to parsing, compiling, and meta-language. Stacks and recursion. CSci 201 is equivalent to CSci 147 or 157, and 160. May not be taken for graduate credit by majors in computer science. Prerequisite: CSci 51 or equivalent (Pascal) and programming experience using assembly language. (Fall and Spring) (Bock)
- 203 **Microprocessor System Design** (3)  
Unified approach to the design of 8-, 16-, and 32-bit microprocessor-based systems. Microprocessor (CPU) and system architecture. PMS- and ISP-level description. Instruction formats and microprocessor programming. Microprocessor arithmetic. Operation and bus-timing diagrams. CPU and systems buses and signals. Hardware-software design equivalence. RTL description of a microprocessor, advanced architectural and systems concepts. Memory and I/O system design and interfacing techniques. Memory management techniques and structures. Bit-sliced microprocessors. Prerequisite: CSci 154 or permission of course director. (Fall and Spring) (Alexandridis)
- 212 **Discrete Analysis in Computer Science** (3)  
Formal systems, fundamentals of graph theory, combinatorics and combinatorial algorithms, complexity theory, discrete probability, and the generation of random variables and sequences. Applications to the analysis of algorithms, simulation, and other problems in computer science. Prerequisite: CSci 161 or permission of instructor. (Fall) (Berkovich)
- 215 **Advanced Data Structures** (3)  
Sparse matrix transpose and multiplication. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch-Schorr-Waite algorithm, the Knuth-Morris-Pratt algorithm. In-order, preorder, and postorder traversal of trees, alpha-beta pruning. Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal algorithm, topological sorting, shortest paths in a graph. Quick sort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees, B-trees, and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 160, 161. (Spring) (Berkovich)
- 216 **Information Retrieval Systems** (3)  
Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural lan-



guage used for retrieval systems; dictionary systems, including thesaurus look-up and phrase structures; searching strategies and cataloging. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 160 or permission of course director. (Spring) (Berkovich)

**217 Computing Algorithms (3)**

Design and analysis of basic classes of algorithms: divide-and-conquer, greedy dynamic programming, tree and graph traversals, backtracking, branch-and-bound. Applications to problems such as sorting and searching, graph coloring, traveling salesperson, knapsack, and scheduling. Lower bound theory. NP-hard and NP-complete problems. Prerequisite: CSci 160, 161. (Fall and Spring) (Berkovich)

**219 Interactive Computer Graphics II (3)**

Raster display system architecture and display technologies. Clipping and scan-conversion algorithms. Three-dimensional homogeneous coordinates and viewing. Visible-surface determination and shading models. Prerequisite: CSci 185, 217 or 258. (Spring) (Sibert)

**220 Pattern Recognition (3)**

Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction. Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Computer applications and projects. Prerequisite: EE 204. (Fall) (Loew)

**221 Machine Learning (3)**

Learning as an alternative to traditional, rule-based schemes for artificial intelligence. Game theory: a formalism for specifying interactive processes. Deterministic and probabilistic simulation of games. Random number generation and testing. Markovian and bounded-context systems. The *algedonic* process. Introduction to collective learning systems theory. Design, simulation, and evaluation of collective learning automata. Case studies, readings, and projects. Prerequisite: CSci 174, 232; or permission of course director. (Fall) (Bock)

**222 Design of User-Computer Dialogues (3)**

Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interaction techniques, command language syntaxes, and data presentations. Design methodology and guidelines. Case studies, research readings, and projects. Prerequisite: CSci 160 or permission of course director. (Spring) (Foley)

**224 Artificial Intelligence (3)**

Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill climbing, network searching, min-max and alpha-beta pruning. Problem-solving systems. Prerequisite: CSci 174, 232. (Fall and Spring) (Garcia)

**226 Robotics (3)**

Industrial automation. Manipulator and sensor technology. Feedback loops and analog servos. Multiple degrees of freedom and coordinate systems. Joint-space-work-space transformations and data structures. Point-to-point continuous path control. Robot control: command languages, navigation and mapping, optical and acoustic ranging and pattern recognition, collision-avoidance algorithms, positioning accuracy, resolution, and repeatability. Distribution of intelligence. Adaptive hierarchical control. Class projects using the Mobile Robot in the Interactive Systems Lab. Prerequisite: CSci 174 or permission of course director. (Spring) (Bock)



## 227 Management Information Systems and Database Management (3)

Concepts in management information systems. Commercial programming features of COBOL and PL/1. Inverted files and query systems. Editing, report generation, updating, and updating load. Trade-off between direct access and indexed-sequential access. Maintaining large programming systems that lead to the need for database management systems; construction of database management systems. Survey of some existing database systems. Relational database concepts and future developments. Conceptual and logical design of a database. Prerequisite: CSci 160. (Fall) (Rotenstreich)

## 229 Computer Security Systems (3)

Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, statistical inference controls. Effects of operating systems and machine architecture on security. Cost trade-offs among various countermeasures. Information flow models. Automated and manual risk-analysis systems. Related nontechnical measures. Companion course to EE 250. Prerequisite: CSci 160 or equivalent. (Fall) (Hoffman)

## 230 Information Policy (3)

Topics of current interest in information policy, including privacy, freedom of information, antitrust and other business implications of policies, transborder data flow, information as a weapon, cryptographic policy, international aspects of information law and policy, technology transfer, electronic funds transfer, electronic mail, criminal justice information systems, and cross-cultural implications and the lower classes. May not be taken for graduate credit by majors in computer science. Prerequisite: CSci 100 or equivalent. (Spring, even years) (Hoffman)

## 231 Sequential Machines (3)

Finite-state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables, partition theory, decomposition of machines, asynchronous machine design, structural simplicity, and design with ROMs and PLAs (planar logic arrays). Prerequisite: CSci 154, 161. (Fall, even years) (Friedman)

## 232 Automata and Formal Languages (3)

Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory, including grammatical construction, recognizers, relationships between machines and grammars. Nondeterministic automata. Prerequisite: CSci 153, 160, 161. (Fall and Spring) (Feldman)

## 235 Parallel Computer Architecture (3)

Introduction to high-speed computer architecture. Parallel architecture, memory and I/O subsystems. Principles of pipelining and vector processing, pipeline computers and vectorization methods, examples of vector processors. Structures and algorithms for array processors, SIMD computers, interconnection networks, associative array processors. Prerequisite: CSci 154. (Fall) (Meltzer)

## 239 Comparative Computer Systems (3)

Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 154. (Spring) (Meltzer)

## 240 Theory and Practice of Microprogramming (3)

Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Micro-programming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems and their



interfaces with real-time systems. Prerequisite: CSci 154. (Spring, even years) (Friedman)

**243 Fault-Tolerant Systems and Design Automation (3)**

Fault-test generation for combination and sequential circuits, digital simulation as a diagnostic tool, design of easily tested and fault-tolerant systems. Physical packaging of digital circuits; design of circuit boards, including partitioning, placement, and interconnection of elements. Prerequisite: CSci 154. (Fall, odd years) (Friedman)

**244 Data Communications (3)**

Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexers, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data-collection loops, multidrop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: CSci 154, 160; or permission of course director. (Spring) (Meltzer)

**245 Computer System Performance (3)**

(Formerly *Advanced Computer Systems Theory I*)

Fundamentals of performance evaluation of digital computer systems. Queuing models of computer systems and applications of queuing theory to computer modeling. Bounds on system performance. Mean-value analysis of computer systems. Modeling specific subsystems, such as memory, disks, and processors. Use of queuing models for analysis of existing and proposed systems and for capacity planning. Limitations of queuing models. Analysis of transaction processors, terminal-oriented systems, and batch processing. Prerequisite: CSci 237. (Fall) (Meltzer)

**247 Languages for Systems Programming (3)**

Use of a macroassembler in structured programming. Conditional assembly. Design and programming of an assembler, macrogenerator, and loader. Prerequisite: CSci 147, 159. (Spring) (Maurer)

**255 Analysis and Correctness of Algorithms (3)**

Basic tools of analysis of algorithms. Space and time measures,  $O(n)$  and  $O(f(n))$ , computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 258. (Fall) (Maurer)

**256 Design of Translators (3)**

Introduction to programming language implementation. Overview of compilers, interpreters, and assemblers. Lexical analysis. Introduction to classical parsing techniques. Symbol tables and static semantic analysis. Code generation and run-time environments. Writing a recursive-descent compiler for a simple block-structured language. Prerequisite: CSci 232, 258. (Spring)

**258 Advanced Programming Languages (3)**

Issues in modern programming languages. Data abstraction. Classical and experimental control structures. Exception handling. Portability and standardization of programming languages. Student programming projects will compare alternative models as embodied in languages such as Ada, Modula-2, LISP, Snobol4, C, and APL. Prerequisite: CSci 160, 161. (Fall and Spring) (Feldman)

**267 Operating Systems I (3)**

Introduction to the operating system for batch-oriented, multiprogrammed computer systems. Software components that constitute the operating system. Facilities of the macroassembler utilizing the operating system, loading and linking routines, initializing programs and tasks, dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions, device and storage management. Input-output control and use of access methods. Performance evaluation. Prerequisite: CSci 215 or 217. (Fall) (Rotenstreich)



**268 Operating Systems II (3)**

Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system; deadlocks, processor utilization, and I/O management. System availability and fail-safe mechanisms. Time-slicing and time-sharing operating systems and subsystems, transaction-processing subsystems, memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and introduction to the computer as a utility. Introduction to security and large database management. Prerequisite: CSci 267. (Spring) (Rotenstreich)

**270 Software Engineering (3)**

The life-cycle model. Requirements and specifications. Design models, structured and object-oriented design. Program development, PDL's tools, configuration control. Program, unit, and integration testing. Program verification. Other development models. Development metrics. Computer-aided software engineering (CASE). Prerequisite: CSci 217, 258. (Spring) (Rotenstreich)

**281 Numerical Solutions of Algebraic Systems (3)**

Numerical solutions of linear algebraic equations and the algebraic eigenvalue problem. Sparse matrix techniques. Solutions of nonlinear simultaneous equations. Multidimensional search algorithms. Interpolation and extrapolation. Prerequisite: CSci 155. (Fall) (Della Torre)

**282 Numerical Solution of Ordinary Differential Equations (3)**

Classical treatment of numerical solutions of problems in one dimension, with emphasis on the application of the calculus of finite differences in the derivation of the various methods. Error analysis and the propagation of errors; Lagrangian interpolation; interpolation in tables and the calculus of finite differences; numerical quadrature; zeros of functions and zeros of polynomials; solution of ordinary differential equations by finite difference, predictor-corrector, and Runge-Kutta methods; boundary-value and eigen-value problems of ordinary differential equations. Prerequisite: advanced calculus. (Spring, even years) (Della Torre)

**283 Numerical Solutions to Field, Wave, and Diffusion Problems (3)**

Finite difference, finite element, and boundary element methods. Eigenfunction solutions. Boundary approximation. Graphical presentation of results. Convergence acceleration techniques. Prerequisite: CSci 281. (Spring, odd years) (Della Torre)

**285 Approximation of Functions and Data Representations (3)**

Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 155. (Fall, odd years) (Meltzer)

**297 Special Topics in Computer Science (1 to 3)**

Topic to be announced in the *Schedule of Classes*. (Fall and Spring)

**298 Research (arr.)**

Applied research and experimentation projects, as arranged. May be repeated for credit. (Fall and Spring)

**299-300 Thesis Research (3-3)**

(Fall and Spring)

**319 Interactive Computer Graphics III (3)**

Parametric cubic curves and bicubic surfaces. Color models. Stochastic modeling. Multiple-processor display system architectures. Window managers and user interface management systems. Current topics. Prerequisite: CSci 219. (Fall, even years) (Foley)

**321 Advanced Machine Learning (3)**

A universal model for the structure and function of collective learning systems. Design, application, and performance evaluation of collective learning automata. Efficient data structures for transition spaces. Forward and backward contexts. Stationary/nonstationary and progressive/nonprogressive policies.



- Environment, compensation, update, and selection policy alternatives. Metrics for performance evaluation of collective learning automata. Self-organizing, hierarchical networks of learning cells. Genetic and evolutionary models for reproduction and expiration of automata. Prerequisite: CSci 221, 224. (Spring) (Bock)
- 322 **Natural Language Understanding (3)**  
Survey of the state of the art of natural language parsing and semantic understanding by computer systems. Review of formal, context-free, and transformational grammars and parsing. Augmented transition networks: problems of complexity, semantics, and context. Deterministic parsing: Marcus nontracking systems and ungrammatical input. Semantic parsing: semantic nets and scripts. Prerequisite: CSci 224. (Spring) (Bock)
- 324 **Knowledge-Based Systems (3)**  
The design, structure, and application of expert systems in artificial intelligence. Knowledge representation, data bases, inference engines, rule sets, and user interfaces. Specific tools used to build expert systems, including semantic networks, frame systems, and deduction-inferencing mechanisms. Applications of expert systems, including consultation, CAI support, circuit analysis, intelligent front ends, and planning systems. Examination of case studies, including EMYCIN, SACON, PROSPECTOR, TERESIAS, GUIDON, and SOPHIE. Prerequisite: CSci 224. (Fall) (Bock)
- 327 **Advanced Topics in Information Systems (3)**  
Special topics, such as architecture of information systems, organization of large dynamic files, multidimensional search, user interfaces, and database machines. Students are encouraged to present reports in information systems research. Prerequisite: CSci 159 and one course chosen from CSci 215, 216, or 226; or permission of course director. (Fall, odd years) (Berkovich)
- 335 **Advanced Computer Architecture (3)**  
Array processors, SIMD computers, performance enhancements, multiprocessor architecture, MIMD processors. Interconnection networks, memory organization, concurrency problems. Multiprocessing control algorithms, deadlock problems, synchronization, parallel algorithms, data flow computers. Prerequisite: CSci 235. (Spring) (Meltzer)
- 337 **VLSI Systems Organization and Applications (3)**  
Impact of VLSI on the philosophy of computer systems design. Computational models for concurrent processing. Concept of cellular automaton. Data flow. Processor arrays. Associative processing. Computer communications. Redundancy and reliability. Fault tolerance. Parallel algorithms and organization of highly concurrent computations for large-scale problems. Specialized applications of VLSI systems. Prerequisite: CSci 217, EE 214, or equivalent. (Fall, even years) (Berkovich)
- 345 **Advanced Computer System Performance (3)**  
Methods of performance evaluation, measurement techniques and tools, instrumentation and simulation methods; analytical techniques, including analysis of CPU-I/O overlap. Work-load characterization, artificial and synthetic workloads. Evaluation of program performance. Improvement of performance through use of timing methods and data placement based on analysis of memory hierarchy. Prerequisite: CSci 245. (Spring, odd years) (Meltzer)
- 356 **Seminar in Programming Design and Implementation (3)**  
Topics may include the following. Approaches to programming language design. Models and methodologies. Top-down and bottom-up parsing techniques. Code optimization techniques. Compilation techniques for special language features, such as parallel processing, coroutines, abstract data types, and nonprocedural languages. Incremental compilers and programming environments. Portability issues, translator writing systems. Prerequisite: CSci 256. (Fall, alternate odd years)
- 358 **Concurrency and Parallelism in Programming Languages (3)**  
Models as embodied in current and experimental programming languages for the support of concurrency and parallelism. Recent work by Ichbiah, Dijkstra,



Hoare, Brinch-Hansen, Liskov, and others. Tasks and rendezvous, semaphores, synchronization, monitors, and message passing. Language support for distributed processing. Languages considered include Ada, Concurrent Pascal, Modula-2, and CSP. Student projects incorporate hands-on experience where feasible; emphasis on comparison of alternative strategies. Research paper required. Prerequisite: CSci 258 or permission of instructor.

(Spring, even years) (Feldman)

390 **Colloquium** (0)

Lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)

391 **Computer Science Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

## Engineering Administration

**Professors** S. Rothman, H. M. Steiner, R. C. Waters, H. B. Sewell (*Chair*), E. L. Murphree, Jr., B. G. Silverman, H. Eisner

**Adjunct Professor** J. Costantino

**Professorial Lecturers** J. B. DuPeza, C. W. Fotis, E. S. Hoe, R. L. Bangert, L. H. Blakey, W. A. Goetz, G. M. Hollander, J. R. Margulies, R. R. Romano, A. N. Kontaratos, G. L. Pauler, W. L. Williams, R. R. Blanchard, S. F. Pauls, R. W. Swezey, D. R. Skeen

**Associate Professor** J. F. Dinwiddie

**Adjunct Associate Professor** G. R. Brier

**Associate Professorial Lecturers** P. D. Rosenberg, V. R. Hayles, I. S. Raju, H. S. Kimmel, J. L. Pokorney, H. J. Peake, R. W. Doyon, J. F. Patrick, L. M. Farrell, D. S. Friedman, C. C. Myers, Jr., J. P. Deason, F. Allario, H. P. Henderson, J. C. Mathews III, P. E. Heartquist, L. E. Putnam, M. P. Clark, C. Alvord, D. A. Wellman, R. B. Davis, J. E. Harris, S. A. O'Neill

**Assistant Professorial Lecturers** J. D. Liveris, M. R. Habib, A. A. Moghadam, R. D. Hofler, P. G. Meikle, F. Suber, Jr., T. P. Henry, L. F. Jackson, S. M. Janssen, R. W. Witzel, J. L. Rogers, Jr.

**Lecturer** A. R. Murray

Programs in the Department of Engineering Administration lead to the Master of Engineering Administration, Master of Science, professional, and Doctor of



Science degrees. The department offers both a general program in engineering administration and specialized programs in management of research and development, artificial intelligence and human factors, construction management, environmental and energy management, information systems management, marketing of technology, systems analysis and management, technology and public affairs, public works management, and transportation management.

### Master of Engineering Administration Degree Program

The program leading to the Master of Engineering Administration prepares students with undergraduate degrees in engineering, natural science, or mathematics for managerial positions in technological and scientific organizations in industry, government, and the armed services.

The program consists of a minimum of 33 semester hours of approved graduate course work without a thesis or 24 semester hours of approved courses and a master's thesis (equivalent to 6 semester hours). It is designed to give students a broad understanding of the administrative process and help them to develop managerial skills in the functional areas of engineering administration. Although years of experience are required to develop the ability, insight, and mature judgment that distinguish an effective manager, a graduate professional management curriculum can give the student an excellent start. One of the program's main objectives is to help the student learn to examine problems from the managerial point of view. By integrating past experience with graduate study, each student develops a personal frame of reference for managing technological and scientific organizations.

The management of technological organizations is one of the greatest challenges of our times. The professional engineering manager today must understand both the technologies being developed and the rapidly changing marketplace in which these technologies will be applied. The engineering administrator is the link between these dynamic technologies and the needs of society. Therefore, the program in engineering administration provides an opportunity for students to both enhance their technical knowledge and sharpen their administrative skills.

### Admission Requirements

An applicant for the Master of Engineering Administration program must have an undergraduate degree in engineering, natural science, or mathematics. In addition to the requirements for admission to graduate study in the School, applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have basic knowledge of calculus, the principles of management, engineering economic analysis, and quantitative methods. These requirements, except for calculus, can be met by satisfactory completion of EAd 150, 160, and 170 or approved equivalents. (2) The applicant may be required to complete other undergraduate prerequisite courses with a grade of C or better (in some cases, a grade of B or better may be stipulated). If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the master's degree and, unless approved by the adviser, all prerequisite courses must be completed before the student registers for graduate courses.

A student must be accepted in a graduate program to receive credit for any graduate courses taken to satisfy degree requirements.



### Master's Comprehensive Examination

All students must pass the Master's Comprehensive Examination, which is given twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination.

The examination lasts four hours. It is designed to demonstrate the student's ability to integrate material from several course areas and apply what has been learned. The examination is drawn from prerequisite and core courses; however, answers should be supplemented by information from other courses.

The comprehensive examination may be taken any time after completion of the core courses. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. If the student fails the examination on the second attempt, the student's graduate status is terminated.

### Core Courses

The following courses are required for the Master of Engineering Administration degree and must be taken prior to any other courses in the program:

EAd 211-12: Engineering Administration I-II (3-3)

EAd 269: Elements of Decision Making and Problem Solving (3)

### General Program in Engineering Administration

The general program in engineering administration provides the background managers need to confront the increasing complexities of science and technology. Technical knowledge is complemented by understanding of management theory and practice as applied to the administration of engineering and science. The program emphasizes study of general administrative problems and opportunities as well as the use of specific knowledge and methods to solve problems and explore opportunities. Each student designs a program of study in consultation with the adviser. The program must include the following:

EAd core courses (9)

EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)

Electives (15-21): Chosen from the Department of Engineering Administration and other departments of the University, with no more than two courses selected from other departments

### Areas of Concentration

Students who wish to pursue a specific area of concentration, rather than follow the general program in engineering administration, may select one of the programs described below.

### Management of Research and Development

The program prepares students for managerial positions in organizations that conduct, plan, or administer programs of technological or scientific research and development. The program of study designed by each student in consultation with the adviser must include the following:



EAd core courses (9)

EAd 207: The Personnel Function for Engineering Administrators (3)

EAd 255: Administration of Research and Development (3)

EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)

Electives (9-15)

### Construction Management

This program encompasses all levels of construction management: in the field, in the project office, and in the main office. It covers such areas as basic planning, design, and construction methods; problems of contracts and specifications; techniques of scheduling and control; and labor relations and industrial psychology. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)

EAd 241: Construction Management I (3)

EAd 242: Construction Management II (3)

EAd 261: Economic Analysis in Engineering Planning (3)

EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)

Electives (6-12)

### Environmental and Energy Management

This program prepares students for positions in organizations concerned with environmental, energy, and related resource management, including programs in environmental control and energy conservation, energy resource development and use, and prevention and control of environmental pollution. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)

EAd 221: Environmental Management (3)

EAd 222: Energy Management (3)

EAd 261: Economic Analysis in Engineering Planning (3)

EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)

Electives (6-12)

### Marketing of Technology

This program prepares students to market technical products and services internationally. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)

EAd 293: Technical Enterprises (3)

EAd 294: Marketing of Technology I (3)

EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)

EAd 311: Marketing of Technology II (3)

Electives (6-12)

### Public Works Management

The public works sector is one of the largest and most diverse fields of public service. The program in public works management is designed to help students



apply pertinent knowledge to the field and develop sensitivity to the people-related technical problems that confront the public works professional. The program of study designed by each student in consultation with the adviser must include the following:

- EAd core courses (9)
- EAd 215: Ethical Issues in Engineering Administration (3)
- PAd 231: Personnel Management (3)
- PAd 242: Administration of State and Local Governments (3)
- EAd 297: Problems in Engineering Administration (3) or PAd 290: Special Topics in Public Administration (3)
- Electives (6): Chosen from engineering administration
- Electives (6): Chosen from public administration and/or civil engineering

### Technology and Public Affairs

This program prepares students for decision-making positions concerned with the impact of technology on public policy and the interrelationship between modern technology and public affairs. The program of study designed by each student in consultation with the adviser must include the following:

- EAd core courses (9)
- EAd 261: Economic Analysis in Engineering Planning (3)
- EAd 288: Technology Issue Analysis (3)
- EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)
- EAd 386: Advanced Topics in Management (3)
- Electives (6-12)

### Transportation Management

This program prepares students to manage transportation systems or formulate transportation policy. The program of study designed by each student in consultation with the adviser must include the following:

- EAd core courses (9)
- EAd 261: Economic Analysis in Engineering Planning (3)
- EAd 265: Transportation Management I (3)
- EAd 266: Transportation Management II (3)
- EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)
- Electives (6-12)

### Master of Science Degree Program

The Department of Engineering Administration also offers several opportunities for interdisciplinary study leading to the Master of Science degree. The program consists of at least 33 semester hours of approved course work without a thesis, or a minimum of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). In addition to the core courses in engineering administration listed below, each student must select an area of concentration. The student is assigned an adviser in the area of concentration with whom a program of study is developed.

### Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the program leading to the Master of Science degree must have a



basic knowledge of calculus, probability and statistics, principles of management, and engineering economic analysis. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: Math 51 and 52, Mathematics for the Social and Management Sciences I and II; EAd 150, Introduction to Engineering Administration; EAd 160, Introduction to Engineering Economic Analysis; and EAd 170, Basic Quantitative Methods for Engineering Administration. A student must earn a grade of C or better in each undergraduate prerequisite course, and in some cases a grade of B or better may be stipulated. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the master's degree and, unless approved by the department chair, all prerequisite courses must be completed before the student registers for graduate courses.

### Master's Comprehensive Examination

All students must pass the Master's Comprehensive Examination, which is given twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination.

The examination lasts four hours. It is designed to demonstrate the student's ability to integrate material from several course areas and apply what has been learned. The examination is drawn from prerequisite and core courses; however, answers should be supplemented by information from other courses.

The comprehensive examination may be taken any time after completion of the core courses. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. If the student fails the examination on the second attempt, the student's graduate status is terminated.

### Core Courses

The following courses are required for the Master of Science degree and should be taken prior to any other courses in the program:

EAd 211-12: Engineering Administration I-II (3-3)

EAd 269: Elements of Decision Making and Problem Solving (3)

[In the systems analysis and management concentration, OR 201 is substituted for EAd 269.]

### Areas of Concentration

Students should select one of the following areas of concentration.

#### Artificial Intelligence and Human Factors

This concentration takes a cognitive approach to artificial intelligence, with emphasis on how humans think and how the brain works. It examines the means by which a researcher can determine users' support system needs, subject-to-user cognitive needs and styles, task requirements, and optimum organizational environments. Students learn how to apply existing AI packages and, more important, how to develop appropriate packages in response to new demands. Course work in the concentration provides hands-on experience in trans-



lating human cognitive behavior into machine intelligence. Students are encouraged to choose electives that complement this approach.

The program of study designed by each student in consultation with the adviser must include the following:

- EAd core courses (9)
- EAd 217: Fundamentals of Artificial Intelligence (3)
- EAd 270: Comparative Expert Systems (3)
- EAd 287: Decision Support Systems and Models (3)
- EAd 290: Human Factors Engineering (3)
- EAd 297: Problems in Engineering Administration (3) (nonthesis option) or EAd 299-300: Thesis Research (6)
- Electives (3-9)

### Information Management

Information has become a major resource of modern organizations. The design and operation of efficient information management systems requires knowledge of both the management process and computer technology. This program offers interdisciplinary study in engineering administration, management science, and computer science. It provides insight into the problems of management, understanding of the viewpoints and techniques of managers, and an appreciation of the technology of data processing and data communications. Two areas of specialization are offered: software systems and applications of information systems.

Only a nonthesis option is offered in this concentration. The program of study designed by each student in consultation with the adviser must include the following:

- EAd core courses (9)
- EAd 251: Management of Information Resources (3)
- EAd 297: Problems in Engineering Administration (3)

The student must also complete the required courses in one of the areas of specialization, as listed below.

#### Software Systems

- \*CSci 160: Concepts of Programming Languages (3)
- CSci 159: Programming and Data Structures (3)
- CSci 227: Management Information Systems and Database Management (3)
- CSci 229: Computer Security Systems (3)

#### Applications of Information Systems

- EAd 254: Computer Systems in Information Management (3)
- EAd 256: Survey of Information Systems (3)
- EAd 295: Management of Technical Information and Databases (3)
- EAd 321: Management of Information Systems and Networks (3)

Additional courses are selected, with permission of the faculty adviser, to total 3 credit hours.

### Systems Analysis and Management

The systems viewpoint has proven useful in designing organizations and detecting, analyzing, and solving organizational problems. It emphasizes the intercon-

requires a knowledge of the PASCAL programming language. This requirement may be met by completing CSci 51.



nectedness of elements and activities of a system, including personnel considerations. There is increasing demand for individuals who can apply this approach to organizational systems.

Analysis and management of organizations from the systems standpoint requires study in both management and operations research. Such study should provide insight into organizations and their personnel, understanding of the viewpoints and techniques of managers with whom the systems analyst or manager must interact, mathematical and statistical tools for analyzing and synthesizing systems, and scientifically based methods for detecting and solving system problems. In addition, the increasing application of computers for management makes understanding of their capabilities essential.

Only a nonthesis option is offered in this concentration. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses, excluding EAd 269 (6)

EAd 281: Systems Analysis and Management I (3)

EAd 282: Systems Analysis and Management II (3)

EAd 287: Decision Support Systems and Models (3)

OR 201: Survey of Operations Research: Deterministic Models (3)

OR 202: Survey of Operations Research: Stochastic Models (3)

OR 235: Systems Modeling for Management and Policy I (3)

EAd 297: Problems in Engineering Administration (3) or OR 291: Problems in Operations Research (3)

Electives: Two courses chosen with adviser's approval, normally from offerings of the Department of Operations Research

## Professional Degree Program

The professional degree program provides graduate study beyond the master's degree in the following areas:

Artificial Intelligence and  
Human Factors

Construction Management

Engineering Administration

Environmental and Energy  
Management

Information Management

Management of Research and  
Development

Marketing of Technology

Public Works Management

Systems Analysis and Management

Technology and Public Affairs

Transportation Management

## Admission Requirements

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer, an applicant must have a bachelor's degree in engineering; for the professional degree of Applied Scientist, an applicant must have a bachelor's degree in mathematics or a natural science. In both cases, applicants must have a master's degree in engineering administration or a related field, with a grade-point average of at least 3.3 (on a 4.0 scale) in course work leading to the degree. Applicants who have equivalent backgrounds may be considered.

Applicants with master's degrees in engineering, natural science, or mathematics may be required to complete the three core courses (EAd 211, 212, 269)



and at least one elective, selected with approval of the student's adviser, with a grade of *B* or better.

### Degree Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting all prerequisites. No courses taken by the applicant to make up deficiencies can be applied toward the professional degree. If course work beyond the prerequisites is taken before admission to degree candidacy, a maximum of 9 hours of this course work can, with the approval of the adviser, be applied toward degree requirements.

### Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student that must include a minimum of 30 semester hours of course work beyond the master's degree, of which 6 are devoted to completion of a professional project. Students whose prior study does not include specified prerequisites may be required to take additional courses. The program of study must be approved by the student's adviser and the department chair.

As part of the program of study, the student selects an area of concentration to prepare for work on the professional project. Additional courses are chosen to support work on the planned project or meet other needs. With prior approval of the adviser, up to 12 semester hours may be taken in other University departments if such work is pertinent to the program. (These 12 hours include any transfer credit.)

### Professional Project

Each degree candidate must submit an acceptable report of a professional project involving the analysis and solution of an actual problem in engineering administration. The project should demonstrate the student's ability to apply newly acquired knowledge, to identify a problem, to work out a solution, and to communicate the results in writing.

When all other course work is essentially completed and with the adviser's approval, the candidate registers for EAd 395-96, Seminar: Professional Project, to receive guidance in the professional project. Before registering for this course, the candidate should identify a project or area of study and prepare a written proposal that includes consideration of the project's feasibility. After registering for EAd 395-96, the candidate must submit a detailed project proposal to the project adviser and the department chair for approval. Six semester hours are assigned for work on the professional project.

### Scholarship

A student studying for the professional degree receives more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.



## Doctor of Science Degree Program

### Admission Requirements

All applicants must meet the general requirements for admission to doctoral study in the School of Engineering and Applied Science. In addition, the applicant must have a master's degree in engineering administration or a related field, with a record of superior academic achievement (a grade-point average of at least 3.5 on a 4.0 scale). Applicants with master's degrees in engineering, natural science, or mathematics may be required to complete the three core courses (EAd 211-12, 269) and at least one elective, selected with approval of the student's adviser, with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after satisfactorily meeting all prerequisites and completing all course and language requirements and qualifying examinations. No courses taken by the student to make up deficiencies can be applied toward the doctoral degree. If course work beyond the prerequisites is taken before admission to the degree program, a maximum of 9 hours of this course work can, with the approval of the adviser, be applied toward degree requirements.

### Language Requirement

A reading knowledge of one foreign language must be demonstrated before the qualifying examination may be taken. The student must obtain the adviser's approval of the language selected.

For doctoral students whose native language is not English, English will be designated as the language to satisfy the student's foreign language requirement. Before taking the qualifying examination, the student must pass an examination in English administered for doctoral candidates in the Department of Engineering Administration by the English for International Students program.

### Program of Study

The program of study will consist of a major and a minor area of concentration. The minor area may be chosen from appropriate areas available in other departments of the University or from the areas administered by this department.

Upon admission to the doctoral program, the student is assigned a faculty adviser. Together they formulate a program of study by which the student will make up any deficiencies, prepare for the qualifying examination, and meet degree requirements. An area of study is selected to prepare the student to undertake dissertation research. Additional courses are chosen to support work on the dissertation or meet other needs. The program of study must be approved by the student's adviser and the department chair.

### Doctoral Qualifying Examination

After completing all course work and fulfilling the language requirement, doctoral candidates in the Department of Engineering Administration must be examined in their major and minor areas of concentration. A typical qualifying examination, covering both fields, extends over four or five days. The examinations are offered twice a year, in the fall and spring semesters, and students must take the major and the minor field examinations in the same semester. The candidate's adviser should notify the department chair of the student's intention



to take the qualifying examination before the end of the first month of the semester in which the student wishes to be examined.

### Dissertation

After passing the qualifying examination, the candidate identifies a project or area of study and prepares a detailed proposal that includes consideration of the merit of the planned research and the adequacy of his or her preparation to conduct it successfully. The proposal is submitted for approval to a selected faculty member, who will serve as the student's director of research, and two additional members of the department who will constitute the proposal committee. Work on the research project is conducted as part of the dissertation course, EAd 399.

### Scholarship

A student must have a cumulative quality-point index of at least 3.4 to receive the doctoral degree. If a student receives more than two course grades below *B* or more than one *F*, study is terminated and further enrollment prohibited.

### Time Limits

A full-time student in the doctoral program is allowed a maximum of five calendar years to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair.

### Special Facilities

#### Artificial Intelligence Laboratory

This research-grade laboratory may be used by students enrolled in EAd 270 and, as available, by those conducting thesis or dissertation research. The laboratory consists of a number of single-user LISP machines connected via a local area network (Ethernet). Each LISP machine is an engineering workstation with a wide range of programmer "workbench" intelligent aids. Most major expert-system packages are in use at the AI laboratory, and a substantial library of expert-system construction kits has been granted to the laboratory by producers such as IntelliCorp (KEE™), Teknowledge (S.1™), and Prolog AI Systems. The INNOVATOR expert-system generator kit was created at the AI laboratory.

In addition, the laboratory contains 12-megabyte Sun-3 workstations (one color and three monochrome) connected via Ethernet to a Sun host with 575 megabytes of storage. This system has a full UNIX/C development environment. Common LISP, and a variety of editing, graphics, windowing, and networking software packages. The Case Object Processing Environment (COPE) is under development on this system. COPE provides for the transparent elicitation of



expert knowledge and automated learning as well as the intelligent handling of knowledge case objects, rules, heuristics, and model and analogy bases. The Sun network is also connected via Ethernet and PC-NFS hardware to two color AT-class machines, allowing AI programs to be ported to these environments.

### Decision Support Systems Laboratory

A computer laboratory is provided for the primary use of engineering administration and operations research students. This laboratory is intended to give hands-on experience in the use of computers as a management tool and provides microcomputers and user-friendly management software programs. When additional computing power is needed, however, the microcomputers can be used as reactive terminals with minicomputers in the School of Engineering and Applied Science and with the University's mainframe computer processing unit. The laboratory is also used for research on decision support systems for management and computer-aided teaching in management education.

### Human Factors Laboratory

The human factors laboratory provides a setting for interdisciplinary research in the area of human-system interaction, with emphasis on the design of human-computer interfaces. Current research projects include investigations of human supervisory control of computer-aided manufacturing systems, cognitive aspects of software design, expert-novice differences in problem solving, and the comparative effectiveness of two- and three-dimensional presentations of graphical information. The laboratory is equipped with IBM computers, statistical packages, graphics software, and various psychometric tests.

## Engineering Administration Undergraduate Courses

- 150 **Introduction to Engineering Administration (3)**  
Interrelationships of engineering, science, and management; interaction among individuals and groups in the engineering environment. Typical activities of engineering managers, motivations of engineers, engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to study of the complete management process in EAd 211-12. (Fall, Spring, and Summer)
- 160 **Introduction to Engineering Economic Analysis (3)**  
Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, cost-benefit ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, Spring, and Summer)
- 170 **Basic Quantitative Methods for Engineering Administration (3)**  
Introduction to quantitative tools and techniques important in engineering administration. Concepts of probability and statistics, and their applications. (Fall, Spring, and Summer)

## Engineering Administration Graduate Courses

- 204 **Administration of Engineering Contracts (3)**  
Study of the total contracting process (including initial budget preparation and justification, execution of a contract, and administration of the contract to completion) considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and Spring)



- 207 **The Personnel Function for Engineering Administrators** (3)  
Principles, theory, and practical considerations of the personnel function for engineering managers, with applications for engineering administration. (Fall)
- 210 **Engineering Law** (3)  
Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research-and-development contracts. (Fall and Spring)
- 211-12 **Engineering Administration I-II** (3-3)  
Comprehensive and systematic study of the administrative process in industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, Spring, and Summer)
- 215 **Ethical Issues in Engineering Administration** (3)  
Moral philosophy from which ethics are derived; ethical issues and problems encountered in the administration of engineering and related areas. Use of case study method to enhance student's ability to recognize ethical aspects of situations and to think analytically and synthetically about such aspects. (Spring)
- 217 **Fundamentals of Artificial Intelligence** (3)  
History of AI, knowledge representation, search and control techniques, natural language processing, computer vision, computer speech, robotics, expert systems, evidential reasoning, AI machines, and features of the LISP and PROLOG languages. Hands-on experience with LISP, a robot arm, a natural language system, and an intelligent database interfacier. Laboratory required. (Spring)
- 221 **Environmental Management** (3)  
Technical, economic, political, administrative, and social forces influencing the quality of the environment and the use of resources. Review of government and industrial programs to combat pollution of the air, land, and water. Review of existing and pending legislation involving environmental and related energy matters, theoretical aspects of specific management problems, tools for assessing environmental impact, institutional designs, procedures for promoting public participation. (Fall)
- 222 **Energy Management** (3)  
Conservation and management of the supply of and demand for energy resources, including petroleum, natural gas, coal, nuclear power, and unconventional forms. Topics include energy legislation; theoretical aspects of pricing and scarcity doctrine; instruments for energy policy; hard, soft, and balanced energy paths; social, legal, and institutional barriers to new technologies in extraction, processing, and utilization. Attention is given to combating scarcity, using methods that have the least cost and environmental impact. (Spring)
- 231 **Program Management** (3)  
Management science, the systems approach, and traditional managerial concepts applied to a variety of typical cases, such as technical programs and projects in government and industry. (Spring)
- 241 **Construction Management I** (3)  
Types of construction procurement, aspects of contracts and specifications important to project management, subcontracting, project income, insurance, bonds, mechanics' liens. (Fall and Spring)
- 242 **Construction Management II** (3)  
Administration of construction projects: planning, scheduling, control, resource allocation, and least-cost expediting (CPM and PERT techniques). Labor relations, project safety (OSHA). Laboratory required. (Fall and Spring)



- 243 **Construction Management III (3)**  
Application of quantitative models to construction management problems using microcomputers. Decision and risk analysis, applied probability concepts, bidding theory and practice, simulation of the construction process, queuing models, dynamic programming. Formulation and solution of quantitative models through the use of case studies. Integrated use of the microcomputer, including database creation and management and spreadsheet programs. Laboratory required. (Fall and Spring)
- 245 **Maintenance Management (3)**  
Maintenance functions and the role of the technical manager in designing, supervising, and implementing maintenance programs. Topics include human aspects of maintenance, preventive maintenance, and computers in maintenance. Prerequisite: EAd 211, 212, 269. (Fall)
- 251 **Management of Information Resources (3)**  
Introduction to analysis, design, and implementation of on-line management information systems, including feasibility studies, requirements analysis, specifications, hardware and software considerations, performance evaluation, implementation plans, and postmortem considerations. Elements of information-processing technology, including data transmission and computer networking. Consideration of time sharing, facilities management, stand-alone computers, service bureaus, centralization versus decentralization, with emphasis on the use of micro- and minicomputers in distributed processing. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)
- 253 **Production Management (3)**  
Consideration of production operations in the context of an integrated company strategy. Process and trade-off analyses, capacity management and planning, technology planning. (Spring)
- 254 **Computer Systems in Information Management (3)**  
Use of computers in information systems, with emphasis on accounting applications. Introduction to microcomputer analytical tools, logic of computers, hardware and software concepts, and data communications. Laboratory required. (Fall, Spring, and Summer)
- 255 **Management of Research and Development (3)**  
Study of technological innovation as a vital part of the organizational adaptation process. Role of the technical manager in using organization, planning, and motivation to accomplish research and development objectives. (Fall)
- 256 **Survey of Information Systems (3)**  
Information systems that provide support for management in areas such as finances, manufacturing, and marketing. Introduction to analysis of data flow, databases, and data communications. Laboratory required. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)
- 261 **Economic Analysis in Engineering Planning (3)**  
Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economics, EAd 269 or permission of instructor. (Fall and Spring)
- 262 **Finance for Engineers (3)**  
Financial concepts encountered in engineering situations: financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, capital formation. (Fall)
- 265 **Transportation Management I (3)**  
Integration of social, technical, economic, and political considerations that shape transportation systems and their management. Focus on modal histories and relative advantages. (Fall)
- 266 **Transportation Management II (3)**  
Investigation of the economics and management of the airline industry from the U.S. and international perspectives. Topics include impact of deregulation and politics on the provision of air transportation. (Spring)
- 269 **Elements of Decision Making and Problem Solving (3)**  
Concepts and quantitative techniques of the scientific method used in solving administrative problems. Role of decision criteria and subjective factors. Baye-



sian analysis. Value of information. Mathematical programming: linear, integer, and dynamic. Introduction to queuing theory. Forecasting. Quality control: control charts and acceptance sampling. Prerequisite: EAd 170 or equivalent. (Fall, Spring, and Summer)

270 **Cooperating Expert Systems** (3)

Human use of intuitional heuristics, parallel reasoning, and holistic analogies considered from a cognitive point of view. Students attempt to model expert human behavior and emulate it in a LISP-machine environment. Includes hands-on experience with expert-system tools, paradigms, and languages and a class project involving a distributed blackboard expert system. Laboratory required. (Fall and Spring)

281 **Systems Analysis and Management I** (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. Prerequisite: EAd 269 or equivalent. (Fall)

282 **Systems Analysis and Management II** (3)

Case studies in systems analysis, including applications to industrial, economic, and military situations. Laboratory required. Prerequisite: EAd 281 or permission of instructor. (Spring)

283 **Systems Engineering I** (3)

Systems approach: tools and techniques of systems engineering and applications to large software development. Prerequisite: EAd 269; corequisite: EAd 254 or equivalent. (Fall)

284 **Systems Engineering II** (3)

Further applications of systems engineering tools and techniques. Prerequisite: EAd 283 or equivalent. (Spring)

285 **Seminar: Administrative Problems** (3)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and Spring)

287 **Decision Support Systems and Models** (3)

Intended to expose managers to decision tools and the modeling process, and modelers and system designers to the decision maker's perspective. Impact of human behavioral, managerial, and situational factors on choice of computer-based technique; simplified models. Review of theory, languages, and methods in system modeling and artificial intelligence. Management of the modeling process, including predesign, software costing (make or buy), development, verification, validation, and implementation cycles. Case studies. Laboratory required. (Fall and Spring)

290 **Human Factors Engineering** (3)

Identifying human needs and human factors of common human-machine interfaces, such as computerized systems, command and control systems, and instrument panels. Theoretical underpinnings of human factors and cognition; human reliability as information processors. Methodologies for measuring and designing machine interfaces from the human factors viewpoint, case studies of successful human-machine interfaces, job design and technological change. Hands-on experience in designing and evaluating interfaces. (Fall)

293 **Technical Enterprises** (3)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. Designed for those working in technical firms and for government personnel who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)

Marketing industrial goods and high-technology projects, with special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 **Management of Databases and Technical Information** (3)

Logical and physical structures of databases: record structures, transaction processing, access methods, inverted files. Traditional storage techniques,



- database management systems, relational databases, databases for computer-aided engineering. Laboratory required. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)
- 297 **Problems in Engineering Administration** (3)  
Project course providing the opportunity to apply concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. (Fall, Spring, and Summer)
- 298 **Research** (arr.)  
Basic or applied research in engineering administration or systems analysis. Open to master's degree candidates in the department. May be repeated for credit. (Fall and Spring)
- 299-300 **Thesis Research** (3-3)  
(Fall and Spring)
- 311 **Marketing of Technology II** (3)  
Special attention to marketing research, negotiation, and international marketing. Required for master's degree candidates in the marketing of technology program. Prerequisite: EAd 294 or permission of instructor. (Fall, even years)
- 321 **Management Information Systems and Networks** (3)  
Advanced course in management information systems (MIS) with emphasis on technologies for making computer/communication networks a reality. Traditional methodologies used in the development of MIS, introduction of computer/communication networks and distributed data processing, and the resulting impact and trends in the development of MIS within organizations. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)
- 344 **Construction Management IV** (3)  
Construction methods and machinery. Examination of equipment available for construction, economics of equipment ownership, selection and management of optimum equipment for projects. Use of microcomputers for equipment simulation. (Fall and Spring)
- 370 **Inventive Thought, Cognition, and Computers** (3)  
Human information process modeling, memory modeling, and normative vs. descriptive cognitive modeling are studied toward a goal of designing knowledge-based systems for computer-aided inventing. Specific cognitive models of inventors, project managers, and caseworkers are considered, along with techniques and principles of self-organizing, adaptive Knowledge-Based Systems, Expert Database Systems, machine learning systems, and intelligent tutoring systems. Projects required. Prerequisite: EAd 270. (Spring)
- 386 **Advanced Topics in Management** (3)  
Reading and discussion of classical and recent literature concerning the philosophy and application of management principles. (Fall, odd years)
- 387 **Technological Forecasting** (3)  
Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)
- 388 **Cost Effectiveness** (3)  
Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost-effectiveness studies, systems approach to cost-effectiveness studies. Prerequisite: EAd 160 or equivalent. (Spring, even years)
- 390 **Human-Computer Interaction** (3)  
Study of the psychological and behavioral aspects of users and their dialogue with a computer. Emphasis is on the application of knowledge of these factors to the design and development of a better human-computer interface. The focus is on human rather than computer issues. Prerequisite: EAd 290 or permission of instructor. (Spring)
- 394 **Advanced Study** (arr.)  
Limited to professional degree candidates in the department. May be repeated for credit. (As arranged)



- 395-96 **Seminar: Professional Project** (3-3)  
Limited to professional degree candidates in the department.  
(Fall and Spring)
- 398 **Advanced Reading and Research** (arr.)  
Limited to professional degree and Doctor of Science candidates. May be repeated for credit. (Fall and Spring)
- 399 **Dissertation Research** (arr.)  
Limited to Doctor of Science candidates. May be repeated for credit.  
(Fall and Spring)



## Operations Research

**Professors** W. H. Marlow, D. Gross, N. D. Singpurwalla, A. V. Fiacco, G. P. McCormick, J. E. Falk, R. M. Soland (*Chair*)  
**Adjunct Professor** R. H. Clark  
**Professorial Lecturers** J. D. Waller, C. C. Sherbrooke, W. R. Nunn, C. Anello, G. R. McNichols, D. R. Edmonds, S. J. Balut, P. J. Evanovich, W. P. Hutzler, J. F. Ince, J. W. Johnson, J. L. Kreuser, S. E. Nevius, B. D. Nussbaum, B. L. Schwartz, W. J. Smith  
**Associate Professorial Lecturer** M. F. McGrath

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, and Doctor of Science and to the professional degree of Applied Scientist.

## Undergraduate Program in Systems Analysis and Engineering

Systems analysis and engineering, scientific methods and engineering techniques are applied to the solution of management problems, particularly those concerning the most efficient and effective use of resources. Practitioners seek to observe, understand, and predict the behavior of human-machine systems so the best decisions about these systems can be made. Applications of systems analysis and engineering can be found almost everywhere—in the single waiting line now used at most banks and post offices; in signal synchronization that improves traffic flow; in the routes and schedules of food distributors, delivery services, and garbage collectors. Other applications include choosing fire station locations; coordinating and scheduling



tasks for large construction projects; scheduling the production of manufactured items such as automobiles and appliances; determining spare-parts needs for the automobile industry and for individual dealers; and calculating fair multiple-shift work schedules for airline crews, nurses, police officers, and emergency service personnel.

Systems analysis and engineering uses a body of specialized methods to design, analyze, and improve operations and management systems. It is an interdisciplinary field, combining many techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

Because of its great range of applications and varied scientific techniques, the profession is dynamic and vital. Systems analysis and engineering should be considered by the student who is interested in using mathematics, statistics, engineering, and other sciences to find practical solutions to problems.

### Core Curriculum

The first four semesters introduce the fundamentals of science and mathematics and include study in English, the humanities, and the social sciences.

During the last four semesters, the student concentrates on professional courses in operations research, computer science, engineering administration, and statistics. In addition, the student chooses a technical elective track in an area of special interest, such as production systems, energy systems, management decision systems, computer systems, or financial systems.

#### First Semester

- CSci 51: Introduction to Computing (3)
- Engl 9 or 10: English Composition: Language as Communication (3)
- Math 31: Single-Variable Calculus I (3)
- Phys 13: General Physics for Engineering and Applied Science (3)
- Elective: Selected from humanities or social sciences (3)

#### Second Semester

- Chem 13: General Chemistry (4)
- CSci 53: Computers and Society (2)
- CSci 56: FORTRAN Programming (1)
- Math 32: Single-Variable Calculus II (3)
- Phys 14: Mechanics and Thermal Physics (3)
- Elective: Selected from humanities or social sciences (3)

#### Third Semester

- ApSc 57: Analytical Mechanics I (2)
- ApSc 113: Engineering Analysis I (3)
- CSci 161: Discrete Structures for Computing (3)
- Math 33: Multivariable Calculus (3)
- Phys 15: Electricity and Magnetism (3)
- Elective: Selected from humanities or social sciences (3)

#### Fourth Semester

- ApSc 58: Analytical Mechanics II (3)
- ApSc 114: Engineering Analysis II (3)
- ApSc 115: Engineering Analysis III (3)
- CSci 147: Assembly Language Programming I (3)



Phys 16: Modern Physics (3)

Elective: Selected from humanities or social sciences (3)

## Systems Analysis and Engineering Curriculum

### Fifth Semester

ApSc 116: Engineering Analysis IV (3)

CSci 159: Programming and Data Structures (3)

Math 124: Introduction to Matrix Theory (3)

OR 101: Survey of Operations Research: Deterministic Models (3)

Stat 187: Introduction to Sampling (3)

Elective: Selected from humanities or social sciences (3)

### Sixth Semester

CSci 160: Concepts of Programming Languages (3)

EAd 160: Introduction to Engineering Economic Analysis (3)

OR 102: Survey of Operations Research: Stochastic Models (3)

Stat 118: Regression Analysis (3)

Elective: Technical elective selected from chosen track (see below) (3)

Elective: Selected from humanities or social sciences (3)

### Seventh Semester

CSci 155: Introduction to Numerical Methods for Computers (3)

OR 135: Systems Modeling for Management and Policy I (3)

OR 190: Applied Systems Analysis and Engineering (3)

Stat 181: Applied Time Series Analysis (3)

Elective: Technical elective selected from chosen track (3)

### Eighth Semester

OR 151: Linear Programming (3)

OR 173: Discrete Systems Simulation (3)

OR 191: Problems in Operations Research (3)

Elective: Two technical electives selected from chosen track (6)

## Technical Elective Tracks

Each systems analysis and engineering major must take four courses in one of the following technical elective tracks.

### Computer Systems

CSci 132: Theoretical Foundations of Computing (3)

CSci 151: System Software and Software Engineering (3)

CSci 156: Introduction to Operating Systems (3)

CSci 173: Theory of Computer Translators (3)

CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)

CSci 177: Programming for Management Systems (3)

CSci 178: Introduction to Database Management (3)

### Control and Instrumentation Systems

EE 11: Linear Networks I (3)

EE 12: Linear Networks II (3)



- EE 172: Control Systems Design (3)
- EE 184: Introduction to Medical Engineering (3)

### **Electrical Energy Systems**

- EE 11: Linear Networks I (3)
- EE 12: Linear Networks II (3)
- EE 31: Fields and Waves I (3)
- EE 177: Electrical Energy Conversion (3)

### **Electromechanical Systems**

- ME 117: Engineering Computations (3)
- ME 126: Fluid Mechanics I (3)
- ME 134: Introduction to Vibration Analysis (3)
- ME 182: Electromechanical Control System Design (3)

### **Environmental Systems**

- CE 193: Hydraulics (3)
- CE 194: Environmental Engineering I: Water and Water Quality (3)
- CE 197: Environmental Engineering II: Water Supply and Pollution Control (3)
- ME 126: Fluid Mechanics I (3)

### **Financial Systems**

- Accy 51: Introductory Financial Accounting (3)
- Accy 52: Introductory Managerial Accounting (3)
- BAd 120: Business Finance (3)
- BAd 123: Investment and Portfolio Management (3)

### **Management Decision Systems**

- BAd 140: Basic Marketing Management (3)
- BAd 183: Logistics Management (3)
- BAd 188: Managing Production/Operations (3)
- BAd 191: Fundamentals of Management (3)
- CSci 177: Programming for Management Systems (3)
- CSci 178: Introduction to Database Management (3)

### **Mathematical Systems**

- Math 101: Introduction to Mathematical Logic (3)
- Math 103: Computability (3)
- Math 113: Introduction to Combinatorics (3)
- Math 121-22: Introduction to Abstract Algebra (3-3)
- Math 139: Advanced Calculus I (3)
- Math 140: Advanced Calculus II (3)
- Math 157: Introduction to Complex Variable Theory (3)

### **Mechanical Energy Systems**

- CE 140: Materials Science (3)
- ME 131: Thermodynamics (3)
- ME 148: Thermodynamic Systems (3)
- ME 194: Energy Conversion (3)

### **Naval Systems**

- NSc 52: Naval Ships Systems I (3)
- NSc 125: Naval Ships Systems II (3)



- NSc 150: Navigation and Naval Operations I (3)  
 NSc 151: Navigation and Naval Operations II (3)

### Network Systems

- EE 11: Linear Networks I (3)  
 EE 12: Linear Networks II (3)  
 EE 20: Introductory Engineering Electronics (3)  
 EE 113: Network Analysis and Design (3)

### Production Systems

- BAd 188: Managing Production/Operations (3)  
 BAd 191: Fundamentals of Management (3)  
 CE 140: Materials Science (3)  
 ME 192: Manufacturing Processes and Systems (3)

### Statistical Systems

- OR 277: Queuing Theory (3)  
 Stat 119: Analysis of Variance (3)  
 Stat 183: Intermediate Statistical Laboratory:  
     Statistical Computing Packages (3)  
 Stat 188: Nonparametric Statistical Inference (3)

### Advanced Standing

Graduates of the systems analysis and engineering program are given 2 semester hours of advanced standing applicable to the master's program in operations research at GWU.

## Operations Research Undergraduate Courses

- 101 **Survey of Operations Research: Deterministic Models** (3)  
 Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33. (Fall, Spring, and Summer)
- 102 **Survey of Operations Research: Stochastic Models** (3)  
 Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: ApSc 115, Math 33. (Fall, Spring, and Summer)
- 135 **Systems Modeling for Management and Policy I** (3)  
 Modeling techniques—including simulation, stock-flow analysis, and feedback systems—combined in a practical framework useful to policy analysis and management science. System dynamics is emphasized, and the principles of systems are employed as a means of structuring the problem-solving process. Problems and case studies are solved through use of microcomputers. (Fall, Summer)
- 151 **Linear Programming** (3)  
 The Simplex method and its variants considered from theoretical and computational points of view. Duality, sensitivity, and parametric programming. Large-scale optimization. Prerequisite: OR 101 or permission of instructor. (Fall and Spring)
- 173 **Discrete Systems Simulation** (3)  
 Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random-number and random-



deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications such as queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, CSci 51, OR 102; or permission of instructor. (Spring)

**190 Applied Systems Analysis and Engineering (3)**

Practical and professional aspects of systems analysis and engineering. Use of existing computer software and development of student computer programs. Analysis and solution of case studies and design problems. Students use the decision support systems laboratory. Prerequisite: CSci 160; OR 101, 102. (Fall)

**191 Problems in Operations Research (3)**

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution using operations research models. Prerequisite: knowledge of FORTRAN or BASIC. (Fall and Spring)

## Graduate Study in Operations Research— Master of Science Degree Program

The master's program in operations research is designed for students with appropriate undergraduate backgrounds who wish to study analytic techniques of management decision making and their application.

Expanded scientific knowledge, combined with growing technological and social needs, has created increased demand for individuals trained in operations research. This discipline applies scientific principles and statistical and mathematical methodology to the study of complex industrial, military, and social systems in order to evaluate the probable consequences of proposed actions, establish criteria for judging the effectiveness of these actions, and assist decision making. The program in operations research provides a quantitative basis for solving problems involving the interaction of many components in the interest of the whole system. Most operations research efforts begin with specific aspects of a problem and proceed to consideration of the system as a whole.

### Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the master's program in operations research must have adequate knowledge of calculus, probability and statistics, and computer programming. This requirement can be met by satisfactory completion of ApSc 115 and 116 and CSci 100, or approved equivalents. These courses can usually be taken concurrently with graduate courses; however, the undergraduate courses do not fulfill any part of the requirements for the master's degree.

### Program of Study and Requirements

The core courses in the field of operations research are OR 209, 216, and 299–300 (for those electing a thesis) or 291 (for the nonthesis option). Students must complete OR 209 and 216 before enrolling in other courses; in certain cases, however, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research or other departments of the University. For the general requirements of master's degree programs, see pages 26–28.



## Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both students interested in applications and those interested in theory. Specific areas of concentration and suggested departmental electives follow.

### General Operations Research

- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 261: Theory of Games
- OR 273: Discrete Systems Simulation
- OR 277: Queuing Theory
- OR 279: Inventory Control

With the approval of the adviser, other courses within the department may be elected.

### Defense Science

- OR 235: Systems Modeling for Management and Policy I
- OR 236: Systems Modeling for Management and Policy II
- OR 237: Logistics Planning
- OR 251: Linear Programming
- OR 261: Theory of Games
- OR 262: Decision Analysis
- OR 273: Discrete Systems Simulation
- OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

### Energy Systems

- OR 235: Systems Modeling for Management and Policy I
- OR 236: Systems Modeling for Management and Policy II
- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 271: Forecasting Techniques
- OR 277: Queuing Theory
- OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

### Logistics Engineering

- OR 235: Systems Modeling for Management and Policy I
- OR 236: Systems Modeling for Management and Policy II
- OR 237: Logistics Planning
- OR 251: Linear Programming
- OR 253: Integer and Network Programming
- OR 271: Forecasting Techniques
- OR 275: Introduction to Scheduling
- OR 279: Inventory Control
- OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Engineering Administration, Management Science, and Electrical Engineering and Computer Science.



### **Mathematical Modeling in Information Systems**

- OR 251: Linear Programming
- OR 271: Forecasting Techniques
- OR 273: Discrete Systems Simulation
- OR 275: Introduction to Scheduling
- OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

### **Mathematical Optimization**

- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 253: Integer and Network Programming
- OR 261: Theory of Games
- OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

### **Model Building for Transportation Flows**

- OR 235: Systems Modeling for Management and Policy I
- OR 236: Systems Modeling for Management and Policy II
- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 254: Applications of Linear and Nonlinear Optimization Theory
- OR 273: Discrete Systems Simulation
- OR 277: Queuing Theory
- OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning.

### **Operations Research in Industrial Engineering Systems**

- OR 237: Logistics Planning
- OR 251: Linear Programming
- OR 252: Nonlinear Programming I
- OR 254: Applications of Linear and Nonlinear Optimization Theory
- OR 271: Forecasting Techniques
- OR 273: Discrete Systems Simulation
- OR 275: Introduction to Scheduling
- OR 277: Queuing Theory
- OR 279: Inventory Control
- OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

### **Quantitative Decision Making for Public Policy**

- OR 235: Systems Modeling for Management and Policy I
- OR 236: Systems Modeling for Management and Policy II
- OR 251: Linear Programming
- OR 254: Applications of Linear and Nonlinear Optimization Theory
- OR 261: Theory of Games



- OR 271: Forecasting Techniques  
OR 273: Discrete Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

### Stochastic Modeling

- OR 271: Forecasting Techniques  
OR 273: Discrete Systems Simulation  
OR 277: Queuing Theory  
OR 279: Inventory Control  
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

## Graduate Study in Operations Research with a Concentration in Management Science—Master of Science Degree Program

The master's program in operations research with a concentration in management science teaches students to apply quantitative techniques to problems of managerial control, decision making, and policy analysis. While it develops knowledge of basic mathematics, the program is oriented toward quantitative modeling of problems and their solution using modern management science software.

### Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the master's program in operations research with a concentration in management science must have adequate introductory knowledge of mathematics and statistics. This requirement can be met by satisfactory completion of ApSc 115 and Math 52, or approved equivalents.

### Program of Study and Requirements

Core courses required in the field of management science are EAd 281 and 287, OR 201, 202, 235, 236, and 299–300 (for those electing a thesis) or 291 (for the nonthesis option). Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is generally selected, with the approval of the adviser, from courses in the Departments of Operations Research, Engineering Administration, and Economics. The following courses are recommended:

- EAd 251: Management of Information Resources  
EAd 253: Production Management  
EAd 254: Computer Systems in Information Management  
EAd 270: Cooperating Expert Systems  
EAd 282: Systems Analysis and Management II  
EAd 295: Management of Databases and Technical Information  
Econ 217–18: Survey of Economics  
OR 251: Linear Programming

For the general requirements of master's degree programs, see pages 26–28.



## **Professional Degree Program**

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed for students interested in pursuing study beyond the master's degree with emphasis on applied subject matter rather than on basic research.

### **Admission Requirements**

Applicants must meet the general requirements for admission to study toward the professional degree in the School: an appropriate master's degree from a recognized institution; a bachelor's degree in engineering, mathematics, or administration; and evidence of a capacity for productive work as indicated by prior scholarship. In certain cases, applicants who have equivalent quantitative backgrounds may be considered.

### **Program of Study and Requirements**

The program of study consists of an applied operations research major and an applied out-of-department minor. A minimum of 30 semester hours is required to earn the professional degree, including (a) a minimum of 12 hours in operations research, (b) Stat 201-2, (c) a 9-hour applied minor in a field other than operations research, and (d) either a 3-hour professional degree project (OR 391) or another 300-level course in operations research. Appropriate minor areas include economics; engineering administration; systems analysis; computer science; systems science, networks, and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems. Professional degree candidates in operations research must pass the department's Master's Comprehensive Examination before their final program of study can be approved. Full-time students are advised to take the examination within one year of their admission; all students must take it within two years. Extensions are permitted at the department's discretion. For the general requirements of professional degree programs, see pages 28-30.

## **Doctor of Science Degree Program**

### **Admission Requirements**

Applicants must meet the general requirements for admission to doctoral study in the School. Outstanding professional performance is also considered in evaluating applicants.

### **Language Requirement**

No foreign language is required for the Doctor of Science degree program in operations research. A proficiency in one computer programming language must be demonstrated before the student is admitted to the doctoral qualifying examination.

### **Programs of Study**

Doctoral programs are planned to give students sufficient breadth in operations research and depth in areas of specialization to enable them to complete dissertations that will make significant contributions to the field. The department



offers two majors: mathematical optimization and stochastic modeling. Two minors are required; one must be mathematical optimization if the major is stochastic modeling. Conversely, a stochastic modeling minor is required for majors in mathematical optimization. The second minor may be chosen from within the department or from other departments of the University, such as applied science; business administration; civil, mechanical, and environmental engineering; economics; electrical engineering and computer science; engineering administration; health care administration; management science; mathematics; statistics; and urban and regional planning. Incoming doctoral candidates will be required to take the department's Master's Comprehensive Examination and must demonstrate superior performance on that examination before final approval of the program of study can be granted. Doctoral candidates must attempt the examination within two years of their admission; full-time students usually take it within one year. Extensions may be granted at the discretion of the department. For the general requirements for doctoral study, see pages 30-33.

### Professional Fields and Research Interests of Operations Research Faculty

	Areas of Specialization	Research Interests
James E. Falk	Mathematical programming Numerical methods Mathematical modeling	Nonconvex programming Sequential optimization problems Sequential games Application of optimization methods to economics, military, logistics, and location problems
Anthony V. Fiacco	Mathematical programming Numerical methods Mathematical modeling Stability analysis	Penalty function methods Approximation and sensitivity analysis in nonlinear programming Parametric solution and bounding techniques Applications to water pollution, structural design, energy, and manpower
Donald Gross	Inventory theory Queuing theory	Queuing approximations Numerical computations for queues Inventory models Closed queuing networks
W. H. Marlow	Mathematical methods and numerical procedures	Logistics Systems effectiveness
Garth P. McCormick	Mathematical programming Numerical methods Mathematical modeling	Rate of convergence of algorithms Nonconvex programming Mathematical programming applied to pollution problems and conservation of resources Energy modeling



Nozer D. Singpurwalla	Applied probability and Bayesian statistics	Applications of time series analysis to reliability problems
	Reliability theory and quality control	Extreme value theory and applications
Richard M. Soland	Time series analysis	Software reliability
	Fault tree analysis	Maintenance policies
	Filtering theory	Reliability modeling
	Uncertainty in expert systems	Foundational issues in statistics
	Mathematical modeling	Missile defense problems
	Discrete optimization	Interactive multiple-criteria decision making
	Decision analysis	Solution and applications of structured integer programming problems
	Multiple-criteria decision making	Discrete optimization in stochastic systems

## Operations Research Graduate Courses

- 201 **Survey of Operations Research: Deterministic Models** (3)  
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33 or permission of instructor. (Fall, Spring, and Summer)
- 202 **Survey of Operations Research: Stochastic Models** (3)  
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: ApSc 115, Math 33 or permission of instructor. (Fall, Spring, and Summer)
- 209 **Mathematics in Operations Research** (3)  
Foundations of optimization theory: linear algebra, advanced calculus, and real analysis. Geometrical interpretations. Numerical methods and use of software. Applications to modeling techniques in operations research. Prerequisite: Math 33. (Fall and Spring)
- 211 **Numerical Methods in Operations Research** (3)  
Solutions of systems of linear and nonlinear algebraic equations. Approximations of functions, numerical integration, solutions of differential and difference equations, computational aspects of modeling techniques, use of software. Prerequisite: OR 209 or permission of instructor. (Spring)
- 216 **Stochastic Foundations of Operations Research** (3)  
Topics in probability theory, stochastic processes, and statistical inference. Foundations of probability, conditional probability, the Poisson process, Markov chains, and Bayesian inference. Prerequisite: ApSc 116 or permission of instructor. (Fall and Spring)
- 233 **Analytic Models for Management and Administration** (3)  
Application of quantitative methods and concepts and experimental techniques taken from system theory, simulation, decision analysis, discounting, queuing, mathematical programming, and functional analysis. For graduate students outside the School of Engineering and Applied Science.
- 235 **Systems Modeling for Management and Policy I** (3)  
Modeling techniques—including simulation, stock-flow analysis, and feedback systems—combined in a practical framework useful to policy analysis and



- management science. System dynamics is emphasized, and the principles of systems are employed as a means of structuring the problem-solving process. Problems and case studies are solved through use of microcomputers. (Fall and Summer)
- 236 **Systems Modeling for Management and Policy II** (3)  
Delays, feedback, and sampling in dynamic problems. Case studies in dynamic policy analysis. Use of microcomputers, electronic spreadsheets, statistics, and simulation. Includes small-group projects. Prerequisite: OR 235. (Spring)
- 237 **Logistics Planning** (3)  
Quantitative methods in model building for logistics systems, including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Stresses applications. Prerequisite: ApSc 115, Math 33. (Spring, even years)
- 251 **Linear Programming** (3)  
The Simplex method and its variants considered from theoretical and computational points of view. Duality, sensitivity, and parametric programming. Large-scale optimization. Prerequisite: OR 209 or permission of instructor. (Fall and Spring)
- 252 **Nonlinear Programming I** (3)  
Basic theoretical and computational topics in optimization theory, including convexity and the optimality conditions. Algorithms for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications. Prerequisite: OR 209 or permission of instructor. (Spring)
- 253 **Integer and Network Programming** (3)  
Methods and applications of optimization problems requiring integral solutions. Implicit enumeration, branch-and-bound, and cutting plane methods. Network programming, including shortest route, maximum flow, minimum cost flow, and minimum spanning tree problems. Elements of computational complexity. Prerequisite: OR 251 or permission of instructor. (Spring, odd years)
- 254 **Applications of Linear and Nonlinear Optimization Theory** (3)  
Analysis of optimization models, including areas of nutrition, water pollution, energy, reliability, inventory control, game theory, chemical equilibrium, portfolio selection, and parameter estimation. Solution of nonconvex optimization problems. Use of sensitivity theory and of the SUMT method for solving constrained problems. Prerequisite: Math 33. (Fall)
- 261 **Theory of Games** (3)  
Study of mathematical models with applications to the relationships among independent competitive entities (that is, persons or organizations in an environment of competition, bargaining, or bidding), selection of optimum strategies, mini-max concept, connections with linear programming, topics in fair division, two-person and  $n$ -person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)
- 262 **Decision Analysis** (3)  
Study of decision making under certainty and uncertainty and under one and several criteria. Decision analysis and decision trees, the value of information, subjective probability and Bayesian statistics, utility and value theories, multiple-criteria decision making and multiple-criteria optimization, goal programming. Prerequisite: ApSc 116 and OR 201 or 251; or permission of instructor. (Fall, even years)
- 271 **Forecasting Techniques** (3)  
Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box-Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Application to engineering, business, and economic situations, using special computer software packages. Prerequisite: OR 216. (Fall, odd years)



- 273 **Discrete Systems Simulation (3)**  
Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random-number and random-deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications such as queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, CSci 51, OR 202; or permission of instructor. (Spring)
- 275 **Introduction to Scheduling (3)**  
Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems. Prerequisite: OR 202, 251; or permission of instructor. (As arranged)
- 277 **Queuing Theory (3)**  
Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and service patterns. Model building, basic solution techniques, and formal theoretical developments. Prerequisite: ApSc 116, OR 202 or 216; or permission of instructor. (Spring)
- 279 **Inventory Control (3)**  
Application of mathematical techniques to decisions about when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints, multi-echelon models. Demand uncertainty and forecasting in inventory models. Prerequisite: ApSc 116, OR 202 or 216; or permission of instructor. (Fall, odd years)
- 281 **Reliability Theory I (3)**  
Topics introducing mathematical and statistical theories of reliability. Mathematical theory: theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, bounds and inequalities. Statistical theory: probabilistic derivation of failure models; censored, truncated, and sequential life testing procedures using Bayesian techniques; commonly used military standard plans. Prerequisite: OR 216. (Fall)
- 282 **Quality Control and Acceptance Sampling (3)**  
Topics covering mathematical and statistical approaches to quality assurance. Control charts, acceptance sampling by attributes and variables, outgoing quality levels, cost of quality, relationship between reliability and quality, Bayesian techniques and time-series methods. Prerequisite: OR 216. (Spring, odd years)
- 291 **Problems in Operations Research (3)**  
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution using operations research models. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and Spring)
- 297 **Special Topics in Operations Research (3)**  
Selected topics in operations research, as arranged. May be repeated for credit. Prerequisite: permission of instructor. (As arranged)
- 298 **Research (arr.)**  
Basic or applied research in operations research. May be repeated for credit. (Fall, Spring, and Summer)
- 299-300 **Thesis Research (3-3)**  
(Fall, Spring, and Summer)
- 351 **Advanced Topics in Mathematical Programming (3)**  
Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed-point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring 1991 and every third year thereafter)



- 352 **Nonlinear Programming II (3)**  
Continuation of OR 252. Optimality conditions, convex analysis, and the development of families of unconstrained and constrained algorithms studied in greater depth. Key results selected for discussion from several topics of current importance in mathematical programming, such as duality, rate of convergence, nonconvex programming, factorable functions, and sensitivity analysis. Prerequisite: OR 252 or permission of instructor. (Fall)
- 353 **Sensitivity and Stability Analysis in Optimization (3)**  
Effects of data perturbations on solutions of a nonlinear programming problem. Theoretical results that characterize and validate calculation of sensitivity of optimal values, solution points, and multipliers with respect to changes in parameters. Sensitivity formulas, bounds for optimal values and solution points. Prerequisite: OR 252. (Spring 1992 and every third year thereafter)
- 354 **Optimization Using Factorable Functions (3)**  
Topics in nonlinear programming when the problem functions are factorable. Natural polyadic structure of derivatives, high-order unconstrained algorithms, matrix methods for nonlinear programming, global solution to non-convex programs, Karmarkar's projective method and related interior point methods. Prerequisite: OR 252. (Spring 1990 and every third year thereafter)
- 371 **Advanced Topics in Forecasting (3)**  
Continuation of OR 271. Estimation of parameters of Box-Jenkins models, transfer function models for relating two or more time series, models for intervention analysis and for feedforward and feedback control schemes. Kalman filtering and Bayes empirical Bayes methods in forecasting. Other techniques useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271. (Spring, even years)
- 373 **Design and Analysis of Simulation Experiments (3)**  
Advanced topics in Monte Carlo simulation of discrete stochastic systems: statistical designs. Perturbation and sensitivity analysis. Initial transient problems. Variance reduction techniques. Principles of random number and random variable generation. Response surface methods. Developments in simulation languages. Prerequisite: OR 273 or permission of instructor. (Fall, even years)
- 377 **Advanced Stochastic Models in Operations Research (3)**  
Selected applied probability models, including the Poisson process, renewal theory, Markov chains, semi-Markov processes, regenerative processes, and continuous-time, denumerable-state Markov processes. Applications to queues, inventories, and other operations research systems. Special topics. Prerequisite: OR 277 or permission of instructor. (Fall, odd years)
- 381 **Reliability Theory II (3)**  
Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, and reliability theory for multistate components. Statistical theory includes recent developments in analysis of failure data. Prerequisite: OR 281. (Spring, odd years)
- 391 **Project for Professional Degree (3)**  
Limited to students in the professional degree program. (Fall and Spring)
- 397 **Advanced Topics in Operations Research (3)**  
Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (As arranged)
- 398 **Advanced Reading and Research (arr.)**  
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall, Spring, and Summer)



**399 Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.  
(Fall, Spring, and Summer)



## Courses Offered by Columbian College

Descriptions of English as a Foreign Language courses and required courses in SEAS undergraduate curricula offered by Columbian College of Arts and Sciences are given below. See the *Undergraduate and Graduate Programs Bulletin* for elective courses in the humanities and social sciences and technical electives offered by departments outside of SEAS.

### Biological Sciences

**11-12 Introductory Biology for Science Majors** (4-4)

Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of inheritance, physiology, development, and cell biology. BiSc 12: General survey of microorganisms, plants, and animals, including morphology, physiology, embryology, ecology, and evolutionary relationships among phyla. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Laboratory fee, \$40 per semester. (Academic year)

### Chemistry

**13 General Chemistry** (4)

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14. Laboratory fee, \$35. After completion of Chem 13, Chem 11-12 may not be taken for credit. (Fall and Spring)

**22 Introductory Quantitative Analysis** (3)

Theory and practice of quantitative analysis by modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Correlated with Chem 23. Prerequisite: Chem 12, 13, or 16. (Fall and Spring)

**23 Introductory Quantitative Analysis Laboratory** (2)

Laboratory complement to Chem 22. Prerequisite or concurrent registration: Chem 22. Laboratory fee, \$35. (Fall and Spring)



**151-52 Organic Chemistry (3-3)**

Introductory course for science majors and others preparing for related graduate work. Systematic treatment of the structure, preparation, properties, and reactions of the principal classes of organic compounds. Fundamental principles of stereochemistry, reaction mechanisms, and spectroscopic methods of analysis are included. Credit may not be earned for both Chem 50 and Chem 151-52. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

**153-54 Organic Chemistry Laboratory (1-1)**

Laboratory complement of Chem 151-52. Introduction to and practice in basic skills of synthesis, separation, and purification of organic compounds. Prerequisite or concurrent registration: Chem 151-52. Prerequisite to Chem 154: Chem 153. Laboratory fee, \$35 per semester. (Academic year)

**English**

**9 English Composition: Language as Communication (3)**

Includes content of Engl 10; offers the advantage of more intensive work on analytical reading and on fluency and control in the writing process. Class meets 5 hours per week. Special fee, \$25. (Fall and Spring)

**10 English Composition: Language as Communication (3)**

Critical examination of what language can do and what student writers can do with language; analysis of various kinds of discourse, focusing on their pragmatic and psychological dimensions. (Fall and Spring)

**110 Writing in Engineering and the Sciences (3)**

Study of writings by engineers and scientists who have considered the implications of technology in the modern world. Concurrently, study and practice of the communication skills needed for careers in engineering and the sciences. Prerequisite: Engl 9 or 10 or EFL 50; junior, senior, or graduate status. Material fee, \$5. (Spring)

**English as a Foreign Language**

**15 Intensive Basic English (0)**

Introduction to basic grammar, vocabulary, and composition. Development of reading, speaking, and listening skills. Twenty class hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, \$70.

**20 Intensive Lower-Intermediate English (0)**

Continued study of basic grammar. Continued practice in speaking, listening, reading, vocabulary, and composition. Emphasis on integration of skills. Twenty class hours per week. Students registered in EFL 20 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, \$70.

**30 Intensive Intermediate English (0)**

Continued practice of grammar with emphasis on complex structures. Further practice in reading, vocabulary, oral communication, and composition. Introduction to academic lectures and note-taking practice. Twenty class hours per week. Students registered in EFL 30 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, \$35.

**40 Intensive Higher-Intermediate English (0)**

Emphasis on skills needed in academic course work. Continued practice in complex grammar, oral communication, vocabulary, note-taking skills, and composition. Practice in reading strategies for unadapted material. Introduction to basic research techniques. Twenty class hours per week. Students registered in EFL 40 will not be permitted to take additional academic work without



approval of the adviser. Sections are offered with general academic and technical emphasis. Tuition is charged at the rate of seven semester hours; laboratory fee, \$35.

**45 Semi-Intensive Advanced English (0)**

Emphasis on skills needed in academic course work. Selective review of grammar. Practice in reading university-level materials, speaking, and study skills. Continued practice in composition and research techniques. Ten class hours per week. Tuition is charged at the rate of five semester hours.

**50 English Composition/Research Methods for International Students (3)**

Composition and library research methods course for students who demonstrate high proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Sections are offered with general academic and technical emphasis. Special fee, \$25.

### Geology

**136 Introduction to Engineering Geology (3)**

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, \$20. (Fall and Spring)

### Mathematics

**31 Single-Variable Calculus I (3)**

Differentiation and integration of algebraic and transcendental functions with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and Spring)

**32 Single-Variable Calculus II (3)**

Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; three-dimensional vectors. Prerequisite: Math 31. (Fall and Spring)

**33 Multivariable Calculus (3)**

Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and Spring)

**124 Linearity and Matrices (3)**

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42, or permission of instructor. (Fall and Spring)

### Physics

**13 General Physics for Engineering and Applied Science (3)**

Lecture (3 hours), recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Topics include geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, \$20.

**14 Mechanics and Thermal Physics (3)**

Lecture (3 hours), recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Topics include collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, the ideal gas, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 13, Math 31. Laboratory fee, \$20.



**15 Electricity and Magnetism (3)**

Lecture (3 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss's Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14, Math 31. Laboratory fee, \$20.

**16 Modern Physics (3)**

Lecture (3 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of special relativity and quantum theory. Topics include relativistic kinematics and dynamics, wave-particle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, \$20.

**Statistics/Computer and Information Systems**

**118 Regression Analysis (3)**

Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127, or ApSc 115. (Fall and Spring)

**181 Applied Time Series Analysis (3)**

Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157-58 or 118.

**187 Introduction to Sampling (3)**

Problems of sampling and sample design. Prerequisite: Stat 91 or ApSc 115, or equivalent. (Fall)



## General Information

### Registration

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than one semester or one summer session.

A student may not register concurrently in this University and another institution that is not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned prior to registration. Forms for requesting concurrent registration are available from the SEAS Admissions and Registration Office.

#### Eligibility for Registration

Registration for the following categories of on-campus students is held on the days of registration stated in the University Calendar and published in the *Schedule of Classes*. A student who is suspended or whose record is not clear for any reason is not eligible to register.

**New Student.** Upon receipt of a letter of admission, a new student is eligible for registration on the stated days of registration.

**Readmitted Student.** A student previously registered in the University who was not registered on campus during the preceding semester or summer sessions must apply for and be granted readmission by the appropriate admitting office before the student is eligible for registration.

**Continuing Student.** A student registered on campus or having continuous-enrollment or leave-of-absence status in the immediately preceding semester or summer sessions is eligible to register, assuming good standing and enrollment in a continuing program.

#### Telephone Registration

Continuing students are required to register by telephone for courses for the following semester. Students are cautioned, however, that registration in a program of courses is predicated on obtaining appropriate academic advisement and on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the registration of any student who has not met the requirements for satisfactory academic performance.

#### Completion of Registration

Registration is not complete until financial obligations have been fulfilled. Attendance in class is not permitted until registration has been completed.



## Registration Changes and Withdrawals

See pages 192 and 204-5.

## Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc., should consult the program announcements of the other institutions. Consortium registration forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. To participate in the Consortium program, students must obtain the approval of an adviser and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the registrar.



## Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1989 summer sessions and the academic year 1989-90.

### Tuition Fees

Full-time undergraduate program (12-17 credit hours)* per semester	\$5,750
Part-time undergraduate program (fewer than 12 credit hours) per credit hour	403
Graduate program, all students, per credit hour	430
Summer sessions, all students, per credit hour	391

<b>Marvin Center Fee</b> (charged all students registered on campus)	
Each semester hour, to a maximum of \$112.50 per semester	\$10.75

<b>Registration Fee</b> (charged all students per semester and summer registered)	\$25
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\*Undergraduates taking more than 17 credit hours per semester will be charged at the rate of 1 credit hour (\$403) for each credit exceeding that limit.



**Additional Course Fees**—In certain courses additional fees, such as laboratory and materials fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

**Computer Usage Fee** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is \$100 for any semester.

**Graduation Fee** (charged all students applying for graduation) ..... \$75

**Residence Hall Fees**—See page 215.

### Special Fees and Deposits

Application fee (all degree candidates), nonrefundable .....	\$45
Advance tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student .....	200
Housing deposit, nonrefundable, charged each applicant for residence hall space .....	300
Late-registration fee, for failure to register within the designated period (charged on-campus students only):	
During first week of classes .....	50
After first week of classes .....	100
Late-payment fee (see Payment of Fees, below) .....	15
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) .....	35
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) .....	15
Returned-check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason .....	15
Binding master's thesis .....	15
Microfilm service and printing announcement of final examination (doctoral candidates) .....	75
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof, except the summer term .....	8
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both .....	50
Waiver examination to qualify for advanced placement .....	20
English test for international students (when required) .....	15
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor (a student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period) .....	10
Transcript fee .....	2
Replacement of lost or stolen picture identification card .....	5

Registration for on-campus courses in the University entitles each student to the following: (1) the use of the University Library, (2) gymnasium privileges, (3) the services of the Career Services Center, (4) admission to all athletic contests, unless otherwise specified, and (5) the *Hatchet*, the student newspaper. These privileges terminate when the student withdraws or is dismissed from the University.



## Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 12 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by \$2,000 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a \$15 late-payment fee and will be subject to the interest charge of 12 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters and the Student Accounts Office will notify the registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of \$35. Accounts that must be referred to a collection service will be assessed all collection costs, including fees charged by the collection agency.

Students auditing courses are subject to all fees charged to students registered for credit.

**Returned-Check Policy.** A student whose check is returned unpaid by the bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment enumerated above.

**GWU Monthly Payment Plan.** The University's Monthly Payment Plan is available to all students. Upon receipt of the appropriate application, the university will establish an account and mail payment coupons and envelopes for use to ensure proper credit of payments. The plan covers an academic year (excluding summer sessions) and requires ten monthly payments, May through February. Payments must be received by the 10th of each month. If a decision is made after May to use this plan, all missed payments must be made to bring the



account current to the time participation is initiated. There is no charge and no interest for using the plan if all payments are made as scheduled.

**Commercial Prepaid and Deferred Payment Plans.** Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

- Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899
- Knight Insured Tuition Payment Plan, 855 Boylston Street, Boston, Mass. 02116
- School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007
- Educational Loan Program, The Riggs National Bank, 1120 Vermont Avenue, N.W., Washington, D.C. 20005
- The Tuition Plan, Inc., 57 Regional Drive, Concord, N.H. 03301

### Off-Campus Courses

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a 13-week or longer credit course may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by October 3, and one-third by November 3 (for the fall semester); one-third at the time of registration, one-third by February 7, and one-third by March 6 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 12 percent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

### Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see Withdrawal, page 204). Financial aid recipients must notify the Office of Student Financial Assistance in writing.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters. No refund of the tuition deposit required of entering students is granted.

1. **Complete withdrawal from the University (on-campus students)**

Withdrawal dated on or before Friday of the first week of classes . .	80%
Withdrawal dated on or before Friday of the second week of classes . .	60%
Withdrawal dated on or before Friday of the third week of classes . .	40%
Withdrawal dated on or before Friday of the fourth week of classes . .	25%
Withdrawal dated after the fourth week of classes . . . . .	None
2. **Partial withdrawal.** If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.



3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
4. **Summer sessions.** In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.
5. **Refund schedule for off-campus registration**

After the first class meeting but before the third class meeting ...	80%
After the third class meeting but before the fifth class meeting ...	50%
After the fifth class meeting .....	None

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education. Federal regulations require that financial aid recipients use such refunds to repay financial aid received for that semester's attendance. This policy applies to institutional aid as well.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

## Financial Aid

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment based on academic achievement and demonstrated financial need. Applicants automatically be considered for honor aid. If they have need, they may apply for need-based aid. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. In addition, loans and assistantships not based on financial need are available to undergraduate and graduates alike.



In general, consideration for financial aid is restricted to students in good academic standing who meet the minimum grade-point average for particular awards and are not financially encumbered by any other University office. All undergraduate gift aid (institutional scholarships and grants and federal grants) requires that the student be working on the first undergraduate degree. Undergraduate gift aid and all federal aid require that the recipient be registered for a full-time course load at GWU.

Applications for institutional or federal aid cannot be processed if the relevant tax returns have not been filed in accordance with the IRS Code. Documents submitted as part of aid applications become the property of the University and cannot be returned. Federal regulations require that the University report suspected cases of fraud or misrepresentation to the appropriate federal, state, and local authorities.

## Scholarships and Other Forms of Aid for Undergraduates

### Honor Aid

**Presidential Honor Scholarships.** Incoming freshmen with superior academic credentials may be eligible for one of GWU's Presidential Honor Scholarships, which are based entirely on academic excellence without regard to financial need. Full- and half-tuition scholarships are awarded to finalists and semifinalists, respectively, in the National Merit Scholarships program, the National Hispanic Scholar Awards Program, the National Achievement Scholarship Program for Outstanding Negro Students, and other such national academic competitions. Half-tuition scholarships are also available to other outstanding applicants. Renewal is dependent on annual reapplication by February 1 and satisfactory academic progress (a B- average for at least 15 credit hours per semester, exclusive of courses not counted toward graduation).

**Engineering Honor and High Honor Scholarships.** These programs were initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only, and financial need is not a requirement for consideration. They are available to transfer students who meet the criteria given below and are U.S. citizens or permanent residents.

The Evelyn Elder and Lloyd Hartman Elliott Engineering Honor Scholarships (EHS), so designated upon the retirement of the former president after 23 years of service to the University, cover one-half the tuition costs of attending SEAS. Engineering High Honor Scholarships (EHHS) cover full tuition. Both may be renewed through completion of the undergraduate degree, provided the recipient is enrolled full time in an engineering curriculum and scholarship criteria are met, with the option of an additional year if the student wishes to pursue graduate study at the master's level. A minimum quality-point index of 3.0 in 15 or more credit hours per semester is needed to retain the EHS, and a minimum quality-point index of 3.3 in 15 or more credit hours per semester is needed to retain the EHHS. A student must reapply for the EHS or EHHS by February 1 each year.

For the EHS, the student must have (1) completed (or be completing by the end of the present semester) 30 semester hours at an accredited community college, college, or university; (2) completed at least 6 semester hours of college calculus or higher mathematics and at least 3 semester hours of college-level physics or chemistry; and (3) achieved an overall grade average of at least 85%



(3.4) and a combined average of 80% (3.2) in college-level mathematics and science courses.

For the EHHS, the student must have (1) completed (or be completing by the end of the present semester) 30 semester hours at an accredited community college, college, or university; (2) completed at least 6 semester hours of college calculus or higher mathematics and at least 3 semester hours of college-level physics or chemistry; and (3) achieved an overall grade average of at least 90% (3.6) and a combined average of 85% (3.4) in college-level mathematics and science courses.

**Residence Hall Awards for ROTC Scholars.** Residence Hall Awards are available to freshmen entering GWU as ROTC scholars and majoring in mathematics, chemistry, physics, or engineering. Qualifying NROTC scholars who are new to the Navy may receive \$4,000 to be applied toward costs of GWU campus housing and meals. GWU freshman receiving scholarships through the Army ROTC Program offered by Georgetown University or the Air Force ROTC Program at Howard University may also receive \$4,000 to cover campus housing and meals. Freshman NROTC scholars with prior experience in the Navy are eligible for awards up to the average charge for GWU campus housing and meals. Renewal of these awards is contingent on annual reapplication and continuation as an ROTC scholar majoring in the fields specified above. Students with demonstrated financial need in excess of the above awards may apply for need-based aid as described below.

### Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based on demonstrated need. The University participates in the Perkins Loan, Pell Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

All undergraduate students must file applications and supporting credentials for financial aid by February 1 preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.\* A student must reapply for financial aid, including scholarships, each year; renewal is contingent upon funds being available when the student completes the application.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Assistance, George Washington University, Washington, D.C. 20052.

### Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry at least 15 semester hours per semester in subjects related to the degree program during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science.

Only students who are enrolled in this University for at least 6 semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for summer sessions financial aid.



The University also offers other scholarships that are open to engineering students.

**American Association of Cost Engineers Scholarship (1977).** Established by the American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum that includes courses related to cost engineering.

**Atlantic Research Corporation Scholarship (1979).** Established by the Atlantic Research Corporation for graduate and undergraduate students. The undergraduate scholarship includes full tuition, books, and fees for a student in the senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered on both a financial-need and a non-financial-need basis. See manager of engineering admissions for further details.

**Frederick Albert and Alma Hand Britten Scholarships (1959).** Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Also available for graduate study.

**Henry Harding Carter Scholarship (1896).** Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

**Henry Parsons Erwin Scholarship (1955).** Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in engineering and applied science.

**George Washington University Board of Trustees Scholarships.** Full- and partial-tuition scholarships that begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines, maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree.

**Louis E. Giles Memorial Scholarships (1966).** Bequest of Susie E. Giles in honor and memory of her husband for scholarships to students in the School of Engineering and Applied Science who need financial assistance. Also available to graduate students.

**The George Hyman Construction Company Scholarships (1974).** Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial-tuition scholarships begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines, maintains a *B* average based on a full course load leading to a degree in civil engineering, and continues to be in financial need.

## Scholarships, Fellowships, Assistantships, and Other Forms of Aid for Graduate Students

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.



## Graduate Scholarships and Fellowships

**Abdelfattah Abdalla Award (1984).** Established in memory of Professor Abdelfattah Abdalla. Dr. Abdalla served his profession as a professor and as chair of the Department of Electrical Engineering and Computer Science. The award is based on academic merit and is made to an incoming full-time graduate student in the Department of Electrical Engineering and Computer Science. Minimum academic criteria for the award are the same as for the Graduate Engineering Honors Fellowship (see below). The award consists of one-half tuition and a \$6,000 stipend for an academic year and is renewable.

**Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship.** For outstanding students in the fields of science, engineering, and medicine.

**American Association of Cost Engineers Scholarship (1977).** See page 196.

**Atlantic Research Corporation Scholarship (1979).** See page 226.

**Frederick Albert and Alma Hand Britten Scholarships (1959).** See page 196.

**Louis E. Giles Memorial Scholarships (1966).** See page 196.

**Graduate Engineering Honors Fellowship (GEHF) Program.**

Established to recognize students who have achieved academic excellence and are interested in starting or furthering graduate work. Students selected for the GEHF Program receive a half-tuition scholarship for the first year of graduate study, which may be renewed for (a) one additional year for master's and professional degree students or (b) two additional years for doctoral students, provided that a minimum 3.4 cumulative quality-point index is maintained while a full-time student. One grade of *F*, regardless of cumulative quality-point index, disqualifies the recipient from further scholarship assistance.

To be considered for the GEHF Program a student must (1) be a U.S. citizen or a permanent resident of the United States, (2) meet current School of Engineering and Applied Science requirements for admission to the appropriate program, (3) have attained approximately a 3.5 grade-point average in the prior degree from an accredited college or university (consideration is given to the content of programs completed and the academic reputation of all postsecondary institutions at which study was undertaken), and (4) provide three letters of recommendation from professors in the previous academic program. Selection is made by the dean of the School of Engineering and Applied Science. A limited number of these fellowships are available each year. Students in the GEHF Program must take at least 9 credit hours at the graduate level per semester, in the degree program in which they have been accepted. At least three months prior to the semester in which they wish to begin study, students should submit applications, transcripts, and letters of recommendation to the appropriate department chair, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

**Norris C. Hekimian Graduate Award (1988).** This award provides support for a graduate student majoring in electrical engineering who is studying and conducting research in the field of analog circuit theory. The award is based on academic merit. For further information, please contact the Chair, Department of Electrical Engineering and Computer Science.

**National Science Foundation Graduate Fellowships.** Fellowships providing tuition, fees, and stipends to students in programs leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and



social sciences and in the history and philosophy of science. Open to students who have been admitted to a graduate program and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

**Phi Delta Gamma Scholarship Endowment Fund (1968).** Established by the Beta Chapter of Phi Delta Gamma (national fraternity for graduate women) for women graduate students.

**Presidential Merit Fellowships (1989).** Established by the University for two full-time doctoral students in the areas of computer graphics and reliability studies. The fellowship provides a stipend of \$14,000 and 18 hours of tuition for the academic year and is renewable. Selection is made by the Dean of the School of Engineering and Applied Science upon nominations from the Department of Electrical Engineering and Computer Science and the Department of Operations Research.

### Assistantships

**Research Assistantships.** Available to graduate students in SEAS programs. Research assistants are expected to work 20 hours per week conducting research in support of an established research program. Stipends range up to \$12,000, depending on the status of the student and the length of the appointment (9 to 12 months). In addition, selected recipients may be awarded tuition assistance. Further information and applications are available in department offices.

**Research Scholar Assistantships, GWU/NASA-Langley Program.** See page 37.

**Teaching Assistantships.** Awarded to qualified graduate students in the School on the basis of academic criteria established by the respective departments. Teaching assistants receive financial compensation of \$900 to \$3,000 per course and tuition for a maximum of 9 credit hours for the semester in which they teach. Further information and applications are available in department offices.

### Industrial Liaison Program Awards

The Industrial Liaison Program (ILP) has been established to develop closer cooperation and communication between the Department of Electrical Engineering and Computer Science, its Institute for Information Science and Technology, and companies that depend upon the technological foundations represented by the department. A steering committee of Washington area industrial leaders has provided important guidance in founding the program, which is structured to meet the needs of both the department and industry. The ILP offers the following awards.

**Abdelfattah Abdalla Award.** See Graduate Scholarships and Fellowships, above.

**ILP Corporate Graduate Student Fellowship.** Awards sponsored by E-Systems, Inc., MELPAR Division and Laboratoire Central de Telecommunications for entering graduate students. The award consists of tuition for 9 credit hours per semester and a \$7,500 annual stipend. The award is renewable if the student's academic performance meets the requirements of the department and funds are available. Applicants must have a minimum grade-point average of 3.5 (on a 4.0 scale) in course work leading to their previous degree and must be U.S. citizens or permanent residents.



**ILP Distinguished Graduate Teaching Assistantship.** Additional cash awards of \$4,000 offered to outstanding first-year students who are selected as graduate teaching assistants. Applicants must have a minimum grade-point average of 3.5 and demonstrate excellent command of the English language. Previous teaching experience is preferred. The teaching assistantship (providing tuition for 9 credit hours per semester and financial compensation of \$2,000 or \$6,000 for the academic year) is renewable if the student meets scholarship requirements and performs satisfactorily as an instructor; the \$4,000 ILP cash award is not renewable. Recipients are encouraged to apply for a research assistantship with a faculty member upon completion of their first year of study.

**ILP Graduate Research Assistant Matching Grant.** The Industrial Liaison Program will provide grants of up to \$5,000 to match awards from the School, to a maximum total of \$10,000 per student for the academic year. Students work with a faculty member on a research project.

**ILP Supplement to the Graduate Engineering Honors Fellowship Program.** Research fellowships awarded to select first-year students who are recipients of the GEHF. The award consists of \$6,000. Fellowship recipients work with a faculty member on a research project.

**Richard E. Merwin Memorial Award.** Awarded annually to an outstanding doctoral student in the Department of Electrical Engineering and Computer Science. Dr. Merwin served his profession as a research professor in the department, as president of the IEEE Computer Society, and as editor of *IEEE Transactions on Computers* and worked on ENIAC, this country's first electronic computer. The award is \$3,000 for one year and is made to a full-time D.Sc. student, based on academic merit. Recipients are not eligible for an additional award.

#### Other Government- and Industry-Sponsored Fellowships

From time to time, individual companies have sponsored graduate fellowships in specific fields of interest. Some recent examples are the following.

**Association of American Railroads Fellowship Grant.** Awarded to the Institute for Reliability and Risk Analysis, for graduate education and research in engineering, operations research, economics, and statistics with special emphasis on reliability, failure data analysis, risk analysis, and statistical methodology. Recipients must work 20 hours per week during the academic year and full time during the summer. The grant provides tuition for up to 9 credit hours per semester and 3 credit hours during the summer, along with a subsistence allowance.

**National Bureau of Standards.** Awarded to two graduate students in the fields of robotics, computer graphics, industrial automation, or computer-integrated manufacturing. Recipients must work 20 hours per week during the academic year and full time during the summer and receive a stipend of \$12,000 per year. Students must meet the minimum requirements for the Graduate Engineering Honors Fellowship to be considered.

#### Other Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional and learned societies, corporations, and others that may be used in support of graduate study is available on the first floor of the Gelman Library. Information is also available on such programs as the Rhodes, Marshall, National Science Foundation, Fulbright, and Luce as well as many others.



## Forms of Aid Available to Undergraduate and Graduate Students

### Resident Assistantships

Resident assistantships are available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part time, and staff members are required to enroll as full-time students in degree programs. Further information may be obtained from the Office of the Director of Housing and Residence Life.

### Loan Funds

The following loan funds are available to undergraduate and graduate students. A separate application must be submitted for all loan programs. Applications for the Perkins Loan Program should be filed no later than February 1 (all undergraduates) or April 1 (graduate students) for the following academic year. Complete information is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Assistance, George Washington University, Washington, D.C. 20052.

**Firsht Loan Fund (1983)**

**George F. Henigan Loan Fund (1975)**

**International Student Loan Fund (1967)**

**Joanne Jacobs Student Loan Fund (1974)**

**Jessie B. Martin Loan Fund (1967)**

**Association of Old Crows Loan Fund (1984)**

**Perkins Loan Program**

**University Student Emergency Loan Fund**

**John Brewster Willis, Jr., Loan Fund in Mechanical Engineering**

**Stafford Loans.** George Washington University is an eligible participant in the Stafford Loan Program. Freshman and sophomores may apply for a maximum of \$2,625 per year; juniors and seniors, a maximum of \$4,000 per year. Graduate students may apply for a maximum of \$7,500 per year. Students who intend to use the loan for payment of tuition at registration should submit an application and all required supporting documents no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).

**Parent Loans for Undergraduate Students/Supplemental Loans for Students.** George Washington University is also an eligible participant in the Parent Loan for Undergraduate Students (PLUS) and Supplemental Loans for Students (SLS) programs. The interest rate on the loans is variable, based on the interest rate of U.S. Treasury bills, to a maximum of 12 percent. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate and graduate students may apply for up to \$4,000 per year for each student. Independent undergraduate and graduate students may apply for up to \$4,000 per year on their own behalf. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).



**CONSERN Loan Program.** This program, jointly sponsored by the District of Columbia and the Consortium of Universities of the Washington Metropolitan Area, provides supplementary aid to creditworthy students and parents who have financial need remaining after having exhausted benefits from all other federal, state, and institutional aid programs for which they qualify (except the College Work-Study Program and PLUS/SLS). Applicants must be enrolled at least half time and must demonstrate financial need otherwise unmet. CONSERN loans range from \$2,000 to the full certified cost of attendance per academic year and carry a variable interest rate.

### Student Employment

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration students may apply at the Career Services Center for interviews and referrals to positions for which they are qualified.

### International Students

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships; those with a *C* average are eligible to apply for GWU Grants. Aid is awarded in the spring for the following academic year. See Need-Based Financial Aid, page 223.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chair of the department or dean of the school in which the degree is to be earned.

International students applying for graduate teaching assistantships must have minimum scores of 570 on the Test of English as a Foreign Language (55 in listening comprehension) and 250 on the Test of Spoken English. International students applying from outside the University may be appointed to graduate teaching assistantships but must attend a five-day orientation and evaluation program held the week prior to registration. Those found to have difficulties with English will be required to enroll in specified courses in English as a Foreign Language (tuition fees for these courses will be waived) and will be assigned nonteaching duties in place of classroom instruction. Such students will be reevaluated each semester; if they are not designated as qualified to give classroom instruction by the end of one academic year, the teaching assistantship will be withdrawn.

Graduate students who are presently enrolled at GWU and have been proposed as candidates for graduate teaching assistantships by their departments must pass the Test of English as a Foreign Language at the levels indicated above and will be required to complete successfully the English for International Students oral interview and the orientation and evaluation program before they will be considered for graduate teaching assistantships.

For further information on requirements for international teaching assistants, contact the office of the Assistant Vice President for Academic Affairs, Rice Hall, fifth floor, George Washington University, Washington, D.C. 20052.



Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is, at a minimum, approximately \$18,900. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

### **Veterans Benefits**

The Veterans Benefits office, located on the third floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as active-duty personnel, veterans, or widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as active-duty personnel, veterans, or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is at 941 North Capitol Street, N.E., Washington, D.C. 20421.



## Prizes

**Abdelfattah Abdalla Prize.** Established as a memorial by the many friends and colleagues of Professor Abdalla and awarded annually to an electrical engineering or computer science junior or senior for scholarship and service to Eta Kappa Nu, IEEE, Tau Beta Pi, or the Department of Electrical Engineering and Computer Science. The recipient must have a quality-point index of at least 3.5. Selection is made by Eta Kappa Nu. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception.

**Norman B. Ames Memorial Award.** Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University. The student receives a cash award, which is presented at the Annual Commencement in May.

**George Ellowitz Prize in Engineering.** Established by Mr. Robert L. Morris in honor of George Ellowitz, a valued employee of the School of Engineering and Applied Science. The prize is awarded annually to a graduating senior who has best demonstrated during his or her undergraduate work a broad interest in the humanities and social sciences as shown by courses taken and/or extracurricular activities. The recipient is awarded the full set of the Encyclopaedia Britannica's *Great Books of the Western World* and has his or her name engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception.

**Alfred Martin Freudenthal Prize.** Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education and awarded annually to the senior who graduates with the highest scholastic standing. To be eligible for this prize, the student must have completed at GWU at least one-half the work required for his or her degree. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception.

**Martin Mahler Prize in Materials Testing.** A one-year membership in the American Society for Testing Materials awarded to the upper-division or graduate student in engineering who submits the best reports on tests in the materials laboratory course, with preference given to prestressed concrete tests. The award is presented at the Annual Commencement in May.

**Tau Beta Pi Outstanding Sophomore Award.** Established by the GWU Chapter of Tau Beta Pi and awarded annually to the student who ranks first in his or her class at the completion of the sophomore year. The award consists of a medal, and the recipient's name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception.



## Regulations

A student enrolled in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws, is suspended, or for any other reason is not registered at the University for one semester or more may reenter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has matriculated at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the faculty) for subsequent registration in the University.

### Student Conduct

All students, upon enrolling and while attending the George Washington University, are subject to the provisions of the *Guide to Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, the Code of Student Conduct, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the office of Judicial Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

### Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and will be held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are legal, moral, and intellectual offenses against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairs, all academic deans, the registrar, and the Vice President for Academic Affairs.

### Withdrawal

Applications for withdrawal from the University or for changes in class schedule must be made on a program adjustment form. The signatures of the course instructor(s), student's adviser, department chair, and, where appropriate, the international student services adviser must be obtained on the form prior to



receiving the dean's approval. Financial aid recipients must notify the Office of Student Financial Assistance in writing.

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations. Unauthorized withdrawal will result in the recording of a grade of Z for the course or courses.

Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

### Changes in Program of Study

A student may not make any changes in an approved program of study without the consent of the faculty adviser, instructor, international student services adviser (when appropriate), and the associate dean. Requests for changes in class registration must be made on a program adjustment form, available in the SEAS Admissions and Registration Office (see Withdrawal, above).

**Adding Courses.** During the first 14 days of the semester, courses may be added to the student's program by submitting a program adjustment form with the necessary signatures.

**Dropping Courses.** Courses may be dropped without academic penalty during the first 28 days of the semester by submitting a program adjustment form with the necessary signatures.

**Late Drop.** Permission to drop a course without academic penalty after the 28th day of a semester may be granted with the approval of the instructor, the student's adviser, the chair of the department in which the student is enrolled, and the associate dean. Requests for late drops must be submitted to the associate dean's office on the appropriate late-drop form and must be accompanied by a program adjustment form and certification of sickness or injury, if such is the cause of the late withdrawal. A late drop may be granted only under both of the following conditions:

1. It is necessary because of exceptional circumstances, such as certified medical absence or forced absence caused by work-related requirements.
2. The grades in all courses involved are C or better for graduate students and D or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

**Change in Course Status.** The status of a course may not be changed from credit to audit or vice versa after the 28th day of the semester.

### Credit

Credit is given only after registration for a course and satisfactory completion of the required work or upon the granting of advanced standing.

**Auditing.** A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. Tuition is charged at the prevailing rate.

**Balance Sheet.** On request, the School's Admissions and Registration Office will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the



degree. A second balance sheet is issued only if the student changes major or degree objectives. It is recommended that a balance sheet be requested at the end of the junior year.

**Postadmission Transfer Credit.** A student who plans to attend another institution not in the Consortium and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the department chair, and the associate dean on a form available in Tompkins Hall, Room 103. Students wishing to take courses in Consortium schools should complete this form and follow the procedures outlined on page 216. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

### Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of \$2 is charged for each transcript. Partial transcripts are not issued.

### Graduation Requirements

Degrees are conferred in February, May, and September.

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he or she is registered; filed an application for graduation prior to the published deadline date; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

**Application for Graduation.** Applications for graduation must be filed by October 1 for the February convocation, February 1 for May convocation, and July 1 for September graduation. (Students who complete degree requirements during the summer sessions will be awarded diplomas dated September 30, although there is no formal convocation at this time.)

**Attendance at Convocations.** Students are required to complete all degree requirements before the convocation to be eligible to attend the February and May Convocations. In addition, doctoral degree candidates are required to meet significantly earlier deadlines than bachelor's, master's, and professional degree candidates. Doctoral candidates should consult their department chair concerning the deadlines for each semester.

**Student Records.** Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in Tompkins Hall, Room 103.

**Area of Concentration Certificate.** Upon successful completion of the master's or doctoral degree, the student may obtain a certificate indicating the area of concentration by submitting a written request to the appropriate department chair.

### The Library

All students registered in the University have the privilege of using the University's Gelman Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.



The loan period for stack books is 21 days. Any book that circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open; they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the Gelman Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

### University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height, weight, and age of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

### Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University administration deems it advisable.

### Right to Change Rules

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

### Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.



### Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

### University Policy on Drugs

The University cannot condone violations of law, including violations of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

## Associations and Services

### Consortium of Universities of the Washington Metropolitan Area, Inc.

Ten universities in the Washington area (American University, Catholic University of America, Gallaudet University, George Mason University, George Washington University, Georgetown University, Howard University, Mount Vernon College, the University of the District of Columbia, and the University of Maryland) are associated in a Consortium through which they coordinate the use of their respective facilities; Mount Vernon College and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all of the members the particular courses that best meet their needs. This privilege is subject to the regulations of the school or division in which the student is enrolled.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, nursing, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.



Students are encouraged to study the program announcements of all participating institutions. See page 189 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in Tompkins Hall, Room 103. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

### University Computer Center

The University Computer Center is in the Academic Center, 801 22nd Street, N.W. The center is normally open 24 hours a day, seven days a week, during the academic semesters; the user area may not be open nights during the winter and summer breaks.

The center provides computational facilities, consultation, and operational assistance as required. It operates two IBM 4381 computers (VM/VS1/CMS). Public terminals and dial-in lines are available for academic users. There is a full range of compilers and application software packages. To complement these mainframe resources, the University also provides extensive PC laboratories and classrooms.

In addition to the central facility, computer services and facilities are available in several of the schools; microcomputers are widely available as well. The University's GW Data Network ties together the mainframes and many of the microcomputers, and the University computers are connected to the national computer networks BITNET and SURANET.

### Computer Information and Resource Center

The Computer Information and Resource Center/User Services (CIRC/US) is the primary source of information and consultation on the use of computers and computer networks at the University. CIRC/US publishes a periodic newsletter on computing issues, gives seminars, and offers technical advice to faculty and students regarding access to and use of the IBM mainframe and microcomputers, the GW Data Network, and microcomputer selection and acquisition. CIRC/US is responsible for distribution of a number of site-licensed microcomputer software packages and administers and can make recommendations on various discount-purchase programs for microcomputer equipment.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics/Computer and Information Systems, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request; the schedule of charges is available at CIRC/US.

### The Speech and Hearing Center

The George Washington University Speech and Hearing Center provides diagnosis and treatment of a wide range of speech, language, and hearing disorders. These include developmental impairments of articulation and language, stuttering, voice disorders, and speech and language impairments resulting from



neurological damage. Evaluation and aural rehabilitation are also provided for hearing-impaired individuals. The Speech and Hearing Center operates in conjunction with the Department of Speech and Hearing.

### Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. Special reading improvement classes are conducted for high school and college students as well as other adults. There is also an After-School Program designed for academically gifted children. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Individuals should contact the center regarding the fee schedule. All fees are payable in advance.

### The Writing Center

The Writing Center offers informal and personal writing instruction; its services are provided free to all GWU students. Students at all levels of experience and expertise are encouraged to use the center for help in identifying writing problems and learning how best to express ideas. Trained tutors (undergraduate peer tutors, graduate students, the director, and other members of the faculty) work with students individually on areas of specific need or interest. Tutors can provide assistance in such areas as organizing a mass of information efficiently and clearly, using correct grammar and punctuation, getting started on a writing project, developing a thesis, providing evidence in support of an argument, and presenting the findings of an experiment or the solution to a research problem.

### GW Television

The main television resource of the University is GWTV, a state-of-the-art ITFS, multichannel broadcast facility. Goals of GWTV are to develop courses and programs in cooperation with academic departments for broadcast off campus; to develop videotapes for class use and for continuing professional education; to expand a program of national and international teleconferences, and to manage the acquisition and maintenance of television equipment and facilities in various instructional units.

Operating from studios located in the Academic Center, GWTV has the capability to receive from and transmit to any communications satellite. Video teleconference programs are delivered to a number of on-campus locations, such as studios, conference rooms, and auditoriums, where participants can interact by telephone link with the originating site.



## ROTC

George Washington University students may enroll through the Consortium in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Limited credit for such courses (primarily advanced ROTC) may be assigned for electives to meet degree requirements at George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

For information on the Naval Reserve Officers Training Corps Program at George Washington University, see page 43.

## Alumni Associations

### General Alumni Association

The objectives of this association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the association is conveyed automatically to anyone who has graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University, who has left the University in good standing, and whose class has graduated is eligible for membership. For Division of Continuing Education students, however, only the "15 credit hours earned" requirement and not the "graduation of the class" requirement applies. Graduates of CCEW certificate programs are also eligible.

The activities of the association are directed by a Governing Board, composed of members representing the constituent alumni of the University's schools and colleges. The voluntary leadership of the association works closely with the staff of the Alumni Relations Office in carrying out association affairs. The association may be contacted through the Alumni Relations Office.

Alumni are encouraged to inquire about available services and programs at the Alumni Relations Office and to keep the office informed of any changes in address or occupation. The office is located in Alumni House, 714 21st Street, N.W., George Washington University, Washington, D.C. 20052.

### Engineer Alumni Association

The Engineer Alumni Association of The George Washington University was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to engineering alumni. The objectives of the association are to provide a link between graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 members elected from the association and the engineers' representatives on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and



one representative each from the faculty of the School and the student body. Those directors chosen by the association are elected each year, prior to the June meeting, to three-year terms. Current board members are listed below.

*Term Expiring 1989*  
 Leslie A. Grant  
 Marshall A. Levitan  
 Tomas A. Pagan  
 John D. Scott, Jr.

*General Alumni  
 Association  
 Representatives*  
 Pastor Farinas  
 Issa Khozeimeh

*Student  
 Representative*  
 Tarriq O. Alfadl

*Term Expiring 1990*  
 Arthur L. Howard  
 Nahid Khozeimeh  
 Jeffrey Meeker  
 James A. Sinsabaugh  
 Herbert E. Wolff, Jr.

*General Alumni  
 Association  
 Member-at-Large*  
 Mary O. Jones

*Faculty  
 Representative*  
 Galip M. Arkilic

*Term Expiring 1991*  
 Jay Mendelbaum  
 Sean Walsh  
 Michael Whitley

*General Alumni  
 Association Faculty  
 Representative*  
 Douglas L. Jones

At the June meeting each year, the board elects officers for its operation during the upcoming year. Following are the officers for 1988-89:

*President:* Nahid Khozeimeh, M.S. 1976; 7005 Milwood Road, Bethesda, Maryland 20817

*Vice President:* Jay Mandelbaum, D.Sc. 1982; 16728 Sioux Lane, Gaithersburg, Maryland 20878

*Secretary:* John D. Scott, Jr., M.E.A. 1981; 7602 Ingle Place, Springfield, Virginia 22151

*Treasurer:* Arthur L. Howard, B.S.(M.E.) 1963; 4600 Foxhall Crescents, N.W., Washington, D.C. 20007



## Student Life

The Office of the Vice President for Student and Academic Support Services establishes policies and procedures for those departments that affect student life, including Lisner Auditorium and the offices of Admissions, Student Financial Aid, Campus Life, Safety and Security, Athletics and Recreation, and the Dean of Students (which includes Housing and Residence Life, the Student Health Service, the Counseling Center, the Career Services Center, International Services, Disabled Student Services, and the Educational Opportunity Program).

### Office of the Dean of Students

The Office of the Dean of Students provides counseling and information for students, administers the nonacademic student disciplinary system, and assists in program development for the Division of Student Affairs. Staff members are well informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office.

### Counseling Center

The Counseling Center fosters personal growth and development and helps individuals with personal, social, career, and study problems that interfere with their educational goals. University students, staff, and faculty are eligible for services. These include (1) short-term individual counseling, group counseling, art therapy, crisis intervention, and referral services for personal problems (e.g., academic pressures, relationship issues, family problems, concerns about sex, self-esteem); (2) educational/vocational counseling and assessment to assist students in planning their majors and careers; (3) workshops designed to facilitate students' learning about themselves and developing new ways of interacting with others (e.g., assertiveness training, stress management, relationship skills, and study skills seminars); (4) consultation with faculty, staff, and student groups about their special needs in designing programs to improve the campus environment.

The center administers the Miller Analogies Test, GWU admissions tests, and special assessments for business and industry. Its Community Vocational Counseling Services provides career counseling and testing to GWU alumni and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial interview from 9 a.m. to 5 p.m., Monday through Thursday, and from 1 to 5 p.m. on Fridays. For most services a modest fee per appointment is charged. An additional materials fee is charged for test batteries. Fee adjustments can be made if financial need is a factor. Disabled students are asked to call ahead so that arrangements can be made to adapt services or to meet at an accessible site.

### Educational Opportunity Program

The Educational Opportunity Program (EOP) provides selected District of Columbia students with financial aid, academic support services, and personal advising to assist them in pursuing undergraduate work at George Washington



University. The EOP staff coordinates a precollege program as well as educational and cultural activities to promote the success and enhance the experience of program participants.

The EOP staff administers the High School/College Internship Program (HI/SCIP), which enrolls highly motivated District of Columbia high school seniors. Participants enroll at GWU as nondegree candidates, taking a maximum of 6 credit hours per semester in addition to their high school curriculum. Application to the HI/SCIP program is made through the student's high school guidance office. Counseling and advising are provided by the EOP staff. HI/SCIP students have access to all of the academic support services available to EOP participants.

### International Services

International students, scholars, faculty, and staff are provided assistance through International Services. The staff offers immigration assistance and information on government requirements and regulations specific to the international community; orientation programs to help with adjustment to living and studying in the United States; and advising and counseling for a variety of personal problems, including cultural adjustment, living conditions, budgets, academic concerns, and financial aid.

### Disabled Student Services

The Disabled Student Services office works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources.

### Student Health Service

The Student Health Service is an outpatient clinic staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Many routine laboratory tests may be performed in the Health Service lab at cost. Allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. The bills incurred from all services rendered outside of the Student Health Service (for example, X-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

**Health and Accident Insurance.** The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should consult the Student Health Service or the Office of the Dean of Students.



## Career Services Center

The Career Services Center provides career planning and job-seeking assistance to students and alumni. Programs and services include full-time and part-time job vacancy listings; career counseling; workshops (e.g., organizing job searches, resume and letter writing, effective interviewing, negotiating for salary); a resource library of career field and employer literature; on-campus interviews for students within one year of graduation; a resume referral service; resume critiques; a call-in job listings service, Jobline; and a credentials service that supports employment and graduate/professional school applications.

## Housing and Residence Life

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing is available at the Off-Campus Housing Resource Center in the Marvin Center.

Admission to the University does not include a room reservation. The student will receive, with the notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a \$300 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room or apartment charge. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester, unless the student elects the deferred payment plan or the 10-month payment plan. Please check with Housing and Residence Life for the deferred payment plan and with the Student Accounts Office for the 10-month payment plan.

### 1989-90 Residence Hall Rates per Person for Two Semesters\*

<b>Adams Hall</b>	
double room .....	\$3,320
triple room .....	3,190
<b>Crawford Hall</b>	
double room .....	3,320
<b>Everglades Hall</b>	
triple room .....	3,320
<b>Guthridge Hall</b>	
apartment for one person .....	3,840 or 3,900
apartment for two persons .....	3,790
apartment for three persons .....	3,460
<b>Building JJ</b>	
apartment for two persons .....	3,650
apartment for four persons .....	3,270 or 3,650
<b>Francis Scott Key Hall</b>	
apartment for one person .....	3,900
apartment for two or three persons .....	3,790
<b>Madison Hall</b>	
double room .....	3,320
triple room .....	3,190

\*Residence hall prices and allocation are subject to change.



Milton Hall*	
apartment for two persons.....	3,650
apartment for three persons.....	3,460
Mitchell Hall	
single room.....	3,560
Munson Hall*	
apartment for two persons.....	3,650
apartment for three persons.....	3,460
Riverside Towers Hall†	
apartment for one person.....	3,910 or 3,980
apartment for two persons.....	3,820
Strong Hall (for women only)	
single room.....	3,560
double room.....	3,320
triple room.....	3,190
Thurston Hall	
double room, triple room, room for four or five.....	3,320

### Food Service

Resident freshmen and sophomores are required to choose one of the following food service plans: the any 14 meals per week plan for \$2,374 for the academic year or the any 10 meals per week plan at \$2,228 for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to the dining room in Thurston Hall and to the second-floor contract dining room in the Cloyd Heck Marvin Center. A small percentage of the meal card may also be used on a cash basis in the Marvin Center first-floor cafeteria, George's, and the Courtyard Cafe at Mitchell Hall.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing and Residence Life Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

### Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center is the campus community center, offering services and recreational and social opportunities for students, faculty, staff, alumni, and campus guests. Its wide range of facilities includes an information center, dining services, offices to accommodate campus organizations, and conference and meeting rooms. The center also provides the setting for a variety of programs conducted by the University Program Board, by the academic departments that include the performing arts, and by other student and faculty organizations.

The Marvin Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the center by working closely with the center's staff in the review and development of policies, guidelines, and procedures that direct the operation of the center.

\*Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate.

†Rates include surcharge for HBO.



## Religious Life

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Several religious bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

## Office of Campus Life

The Office of Campus Life furthers the educational mission of the University by offering programs, services, and facilities that provide students with opportunities for personal, professional, social, and cultural development. The Office of Campus Life includes the Campus Activities Office, Cloyd Heck Marvin Center, and New Student Programs and Services. Staff members assist individual students, campus organizations, and the University community with event planning, program coordination, and participation in special projects, both on and off campus. The staff can also help in interpreting University policies and procedures that affect campus activities. The office is located on the second floor of the Marvin Center. Additional information about the numerous services offered by the Office of Campus Life, and about the various student organizations and committees, can be obtained from the *Student Handbook*.

## Engineers' Council

The Engineers' Council is the elected student governing body for the School of Engineering and Applied Science. The council acts as a liaison between the student body, faculty, and administration of the School and the student government of the University in all matters affecting the general interests and welfare of the student body, the School, and the University. The council sponsors a number of services and activities, including *MECHELECIV* magazine, the Annual School Picnic in the fall, and the Engineers' Week and Engineers' Ball in the spring. The council also nominates a graduating senior for the Norman B. Ames Memorial Award each year and manages the Davis-Hodgkins House. The council is supported by the Engineers' Council fee paid by each student in the School, and elections are held in the spring.

**Davis-Hodgkins House.** The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The house, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

**MECHELECIV Magazine.** *MECHELECIV*, published four times a year by the Engineers' Council, is the award-winning student magazine of the School of Engineering and Applied Science. It contains technical articles and information on campus events and activities. *MELCHELECIV* provides opportunities for SEAS students in all aspects of magazine production, including technical writing, editing, illustration, photography, design and pasteup, and advertising and public relations. The magazine is circulated to all SEAS students and faculty, as well as to members of the administration and alumni who have contributed to the School.



### Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 200 organizations on campus concerning a broad spectrum of interests: academic, professional, international, cultural, political, service, sports, hobbies, recreational, religious, and meditative, as well as social fraternities and sororities. The following are of particular interest to students in the School of Engineering and Applied Science.

### Honor Societies

**Delta Sigma Rho-Tau Kappa Alpha.** A national forensic society.

**Eta Kappa Nu (Theta Iota Chapter).** A national electrical engineering honor society established to recognize scholarship, character, and service.

**Mortar Board.** A national society for juniors and seniors, stressing leadership, scholarship, and service.

**Omega Rho.** A national honor society established to recognize outstanding scholarship in disciplines related to operations research and management science.

**Omicron Delta Kappa.** A national society emphasizing leadership in extracurricular activities.

**Phi Eta Sigma.** A national society established to encourage and reward high scholarship and attainment; limited to those freshmen who attain a scholastic average of at least 3.5 or the equivalent.

**Pi Tau Sigma.** A national mechanical engineering honor society. Candidates are selected from the junior and senior classes on the basis of sound engineering ability, scholarship, and personality.

**Sigma Xi.** A national scientific honor society whose purpose is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

**Tau Beta Pi.** A national engineering honor society whose purpose is to recognize distinguished scholarship and exemplary character.

### Professional Organizations

American Society of Civil Engineers (Student Chapter)

American Society of Mechanical Engineers (Student Chapter)

Institute of Electrical and Electronic Engineers (Student Chapter)

IEEE Communications Society (Student Branch Chapter)

IEEE Computer Society (Student Branch Chapter)

IEEE Engineering in Medicine and Biology Society (Student Branch Chapter)

National Society of Black Engineers (Student Chapter)

National Society of Professional Engineers (Student Chapter)

Society of Women Engineers (Student Chapter)

Theta Tau (Gamma Beta Chapter)

### Athletics, Intramural Sports, and Recreation

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight



rooms; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association and the Atlantic Ten Conference. Its varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

## Major Program Events

**Art Exhibits.** The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. Student art exhibits are presented each semester.

**Concert Series.** The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

**Dance.** The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance production.

**Glee Club, Jazz Band, and Orchestra.** The University Glee Club, Jazz Band, and Orchestra are open to students either as credit courses or as cocurricular activities. All of these organizations present major performances to the University community several times a year, including regular winter and spring concerts.

**International Programs.** The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

**Program Board.** The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

**Theater.** The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students can participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.



## The University

### History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as president and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first president of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the national university he hoped to see established.

The University as it is now organized consists of the Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center, the Elliott



School of International Affairs, and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, and Government and Business Administration; and the Division of Continuing Education.



## University Libraries

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain more than 1,500,000 volumes. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries hold about 17,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic data bases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on interlibrary loan from other libraries in the city, throughout the United States, and in various other countries.



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## Facts About The George Washington University

### General Information

Private, nonsectarian, coeducational,  
founded 1821

### Location

Washington, D.C., bounded by  
Pennsylvania Avenue and 19th, F, and  
24th Streets, N.W.

### Number of On-Campus Students

10,048 full-time; 6,912 part-time

### Geographical Origin of Students

50 states, District of Columbia, and over  
100 countries

### Number of Full-Time Faculty

1,218 (91% with doctoral degrees)

### Number of Part-Time Faculty

557 (includes some of the most  
distinguished men and women in  
Washington)

### Room and Board

Cost varies from approximately \$5,360  
to \$6,280 for the academic year (see  
pages 215-16)

**Undergraduate majors:** Accountancy, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer and Information Systems, Computer Engineering, Computer Science, Criminal Justice, Dance, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, Emergency Medical Services, English Literature, Environmental Studies, Exercise and Sport Science, Fine Arts, French Language and Literature, Geography, Geology, Germanic Languages and Literatures, History, Human Services, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Literature in English, Mathematics, Mechanical Engineering, Medical Record Administration, Medical Technology, Middle Eastern Studies, Music, Nursing Anesthesia, Philosophy, Physician Assistant, Physics, Political Communications, Political Science, Psychology, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech and Hearing Science, Statistics, Systems Analysis and Engineering, Theatre, Travel and Tourism, Zoology

**Study leading to graduate or professional degrees** is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the Elliott School of International Affairs.



## Annual Issues of the University Bulletins

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**National Law Center**, Admissions Office, National Law Center

**School of Medicine and Health Sciences**, Admissions Office, School of Medicine and Health Sciences

**Schedule of Classes—On Campus, Fall, Spring, and Summer**, Registrar

**Schedule of Classes—Off Campus, Fall, Spring, and Summer**, Division of Continuing Education

**Summer Sessions Announcement**, Summer Sessions Office



## The George Washington University

Columbian College of Arts and Sciences, 1821

Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

School of Education and Human Development, 1907

School of Government and Business Administration, 1928

Elliott School of International Affairs, 1928

Division of Continuing Education, 1916/1930/1981

University Hospital, 1898



## College and Schools—Degree Programs

**Columbian College of Arts and Sciences:** Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

**Graduate School of Arts and Sciences:** Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

**School of Medicine and Health Sciences:** Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

**National Law Center:** Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) [M.Comp.L. (Am.Prac.)], and Doctor of Juridical Science (S.J.D.)

**School of Engineering and Applied Science:** Bachelor of Science (Civil Engineering) [B.S. (C.E.)], Bachelor of Science (Computer Engineering) [B.S. (C.Eng.)], Bachelor of Science (Computer Science) [B.S. (C.S.)], Bachelor of Science (Electrical Engineering) [B.S. (E.E.)], Bachelor of Science (Mechanical Engineering) [B.S. (M.E.)], Bachelor of Science (Systems Analysis and Engineering) [B.S. (S.A.&E.)], Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

**School of Education and Human Development:** Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

**School of Government and Business Administration:** Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), Doctor of Philosophy (Ph.D.)

**Elliott School of International Affairs:** Bachelor of Arts (B.A.) and Master of Arts (M.A.)



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